Digitized by the Internet Archive
in 2013

http://archive.org/details/expertw00mitc

LIBRARY
JOHN JAY COLLEGE OF CRIMINAL JUSTICE

EXPERT WITNESS

[illegible]

20815

TO
OTTO HEHNER
PAST PRESIDENT OF THE SOCIETY OF
PUBLIC ANALYSTS

BY

HIS OLD PUPIL

K
2283
.M57
1923b
c. 2

Preface

In some respects this book may be regarded as a sequel to my *Science and the Criminal*, part of which was also concerned with the problems of circumstantial proof, but in its more restricted field its scope is wider, since it discusses not only the methods of scientific proof, but also specialised evidence of every kind.

Although the word "expert" is tending to fall into disuse in America, there is no word in this country which quite covers the same ground, for it connotes a special form of evidence, which, by the way, may be far from justifying its description of "expert" in the sense of "skilled."

The book owes much to the kindness of those who have allowed me to make use of their material and illustrations. In particular, I wish to thank Messrs. Wilder and Wentworth, and their publisher, Mr. R. Badger, for the readiness with which they gave me permission to quote from their standard work *Personal Identification*, and also for various communications and photographs which they have sent me privately.

On writing the chapter on *Experts in Art*, I have been indebted to Major Kaye for the loan of the blocks of radiographs of "Old Masters," which he kindly put at my disposal.

In the last chapter I have attempted to give an outline of some of the ways in which expert evidence can be and has been applied to history, and here my best thanks are due to Mr. F. Chamberlin, who must be regarded as the pioneer in this method of interpreting history, for his permission to quote from his book *The Private Character of Queen Elizabeth*, and to reproduce the portraits of that queen.

It was recently suggested in a review that if Mr. Chamberlin's plan were to come into general use, it would be necessary for the historian of the future to have a medical diploma. This criticism, however, is beside the mark; for the point of the new method is, not that a historian should specialise in medicine or any other science, or in art, but that he should submit his facts to the interpretation of those who have so specialised.

I have tried to fill a gap left by Mr. Chamberlin in his criticism of the "Scandal letter" of Mary Queen of Scots, and this has led me on to an examination of the "Casket letters" at Hatfield. Lord Salisbury has very kindly allowed me to make this examination and to reproduce photographs of the documents, and I am also grateful to the Rev. W. Stanhope Lovell, Librarian at Hatfield, for the trouble he has taken in the matter.

It also gives me pleasure to acknowledge the help given to me by Mr. Otto Hehner, Mr. T. J. Ward, and Miss M. B. Elliott.

White Cottage,
The Common,
Amersham.

Contents

CHAPTER I

EXPERT EVIDENCE

PAGE

Expert evidence in general—Advocacy and expert evidence—Courvoisier trial—Trial of Palmer—Mistakes of observation and deduction—Technical advisers in Court—Scientific referees—Trial of Smethurst—Expert evidence of legitimacy—The Slingsby case—The Russell case—Scope of expert evidence—Direct as opposed to circumstantial evidence - - - - - - - - 1

CHAPTER II

EVIDENCE OF IDENTITY

Instances of mistaken identity—Gorse Hall mystery—The Beck case—Trial of Wood—Flash-light identification—Indirect evidence—Identification by bloodhounds—Photography—The Bertillon system—Fallibility of photographs and measurements—The two Will Wests—Identification of fragmentary remains—The Crippen case—Case of Professor Webster—Identification by the teeth—Footprints in mud—Case of Richardson—Tattoed marks as evidence of identity—Reproduction of face on a skull—Early cave dweller—Case of Dominick la Rosa - - - - - - 14

CHAPTER III

IDENTIFICATION OF SKIN PRINTS

Early references to finger prints—Discoverers of the method—Herschel—Faulds—Galton—Permanence of finger prints—Immutability—Instances of the use of the method—Methods of development—Latent prints on paper—Use of various reagents—Examination of the pores—Locard's methods—Illustrative cases—Sole prints—Wilder and Wentworth's classification—Nose prints of animals - 37

CHAPTER IV

MEDICAL EVIDENCE

PAGE

Scope of medical evidence—Expert evidence on witchcraft—Spontaneous combustion of the human body—Liebig's discussion—Evidence in drowning cases—Trial of Spencer Cowper—Evidence in wounding cases—Left-handed persons—Claims against insurance and railway companies—Insanity and crime—Legal test for insanity—Moral insanity—Absence of motive - 53

CHAPTER V

THE EVIDENCE OF THE CHEMIST

Spontaneous combustion—The Jamaica earthquake—Identification of blood—Evidence in early cases—The blood of different animals—Modern methods of identification and differentiation—Adulteration of food—Gross methods of the 18th century—Appointment of public analysts—Modern methods of adulteration—The question of standards - - 72

CHAPTER VI

SCIENTIFIC EVIDENCE IN POISON TRIALS

Suspicion of witchcraft—Trial of Anne Turner—Early scientific evidence—Trial of Mary Blandy—Katharine Nairn and Patrick Ogilvie—Definitions of a poison—Water as a "noxious drug"—Arsenic as a poison—Smethurst's case—Quantitative estimation—The Seddon trial—Palmer's mixed poisons—Use of little known alkaloids—Dr. Lamson's trial—The Crippen case - - 89

CHAPTER VII

BACTERIOLOGICAL EVIDENCE

Wide scope of bacteriological evidence—Bacteria in everyday life—Vinegar bacteria—Mother-of-vinegar as a "parasite"—Phosphorescence of fish and meat—"Bleeding bread"—Bacteria in soda water—Suggested standard of purity—Bacteriological control of milk—Canned foods—Botulism—The Loch Maree outbreak - - 100

CHAPTER VIII

DOCUMENTARY EVIDENCE

PAGE

Evidence of the water-mark—Microscopical examination of paper and sizing—Erasures—Different kinds of ink—Tests to distinguish between ancient and modern inks—Differentiation of modern writing inks—The Brinkley poisoning trial—Methods of estimating the age of ink in writing—Case of Dr. Cohen—Colonel Pilcher's trial—Invisible inks—Trials of German spies—Case of Kuepferle—German methods of testing for secret writing—Examination of pencil writing—Ancient Egyptian writing—Early pencil writing in the British Museum and Bodleian libraries—Characteristics of graphite pencils—Copying ink pencils—Case of Wood—The Membland case—Evidence from sealing wax—Case of Major Fink—Receipt stamps—Typewritten matter—The Risley case - - 110

CHAPTER IX

THE EXPERT IN HANDWRITING

Dogmatism of early experts—Demonstration of facts as against opinion—Case of Archdeacon Wakeford—Influences affecting handwriting—Similarities in writing of different people—The Beck case—Evidence of relatives and friends—Case of Spencer Cowper—The Perreaus and Caroline Rudd—Evolution of expert evidence—Privileged statements of witness—"General character" of writing—The "Membland" case—Scientific demonstration of facts—Traced signatures—The Sylvia Ann Howland case—The Rice-Patrick case—Modern quantitative measurements—Methods of Persifor Fraser and of Dr. Locard—Graphometry—Measurement of angles—Ratio measurements - 132

CHAPTER X

EXPERTS IN ART

Difficulty of conveying abstract conceptions to a jury—Case of Belt v. Lawes—The "Ghost" and the sculptures—Libel action of Whistler against Ruskin—Outline of the expert evidence—The picture of Ozias Humphrey attributed to Romney—The alleged bust by Leonardo—Anachromisms in materials of paintings—Examination of pictures by means of X-rays—Radiographs of "old masters" showing prior painting - - - - - - 152

CHAPTER XI

APPLICATION OF EXPERT EVIDENCE TO HISTORY

PAGE

Methods of expert interpretation of historical facts—Portraits of Queen Elizabeth—Pailou's composite portrait of Mary Queen of Scots—Medical history of Queen Elizabeth—Mary Stuart and the "scandal letter"—Comparison of the writing with admitted writing of Mary—The "casket letters" at Hatfield—The charge against William Maitland—Examination of the writing—Probable origin of the third letter - - - - - - - 164

INDEX - - - - - - - - - 183

List of Illustrations

Tattooed Back of Japanese Labourer - *Frontispiece*

FIG.		PLATE	FACING PAGE
1.	Portrait of Will West - - -	I.	26
2.	Portrait of the Second Will West -	I.	26
3.	Restoration of the Head of Prehistoric Cave Woman - - - - - -	III.	36
4.	Head of German Criminal - - -	II.	34
5	Skull of the same Man - - -	II.	34
6.	Face Restored by Woman Sculptor -	II.	34
7.	Face Restored by Sculptor - -	II.	34
8.	Restoration of Skull of Dominick la Rosa - - - - - - -	III.	36
9.	Finger Print of Thomas Bewick - -	IV.	38
10.	Enlarged Thumb Prints of Sir William Hercshel - - - - - -	IV.	38
11.	Finger Print of Dr. H. Faulds - -	IV.	38
12.	Enlarged Finger Print of Will West	II.	34
13.	Enlarged Finger Print of the Second Will West - - - - -	II.	34
14.	Latent Finger Print Developed with "Swan" Ink - - - - -	V.	46
15.	Latent Finger Print Developed with Osmium Pyrogallate - - -	V.	46
16.	Latent Prints Developed with Osmic Acid - - - - - - -	V.	46
17.	Imprints of Burglars on Wooden Box. Identified by the Pores - -	VI.	48
18.	Tread Area of Boy's Foot, showing Calcar and Fibular Patterns - -	—	51
19.	Heel Print showing Calcar Pattern -	IV.	38
20.	Heel Print of American Woman showing Rare Calcar Pattern - -	VI.	48
21.	Nose Print of Jersey Cow - -	VII.	52

FIG.		PLATE	FACING PAGE
22.	Nose Print of Sheep Dog	VII.	52
23.	Nose Print of Young Pig	VII.	52
24.	Pasteur's Drawing of Vinegar Bacteria	—	100
25.	Species of Vinegar Bacteria, Enlarged	—	100
26.	Vinegar Bacteria, showing Different Forms	—	100
27.	Bottle of Vinegar, showing "Wads" of Mother-of-Vinegar	VIII.	102
28.	Ink in Writing of 1723	IX.	118
29.	Modern Blue-Black Writing Ink	IX.	118
30.	Portion of Entries in Day Book (*Rex* v. *Cohen*)	X.	120
31.	Effect of a Reagent on Old Writing	IX.	118
32.	Effect of a Reagent on Recent Writing	IX.	118
33.	Pen used for Writing with Lemon Juice	XI.	122
34.	Enlarged Pen Nib showing adhering Vegetable Matter	XI.	122
35.	Lemon showing Reactions for Iron	XI.	122
36.	Portion of Kuepferle's Confession on a Slate	XII.	122
37.	A Page of Gesner's Book, 1565	XIII.	124
38.	Mark made with Ancient Egyptian Graphite	XIII.	124
39.	Mark made with Metallic Lead	XIV.	126
40.	Line in Drawing of 1831. Typical of Old Pencil Markings	XIV.	126
41.	Mark made with Borrowdale Graphite of 1851	XIV.	126
42.	Marks made with Faber's Pencil, showing Sequence of Strokes	XV.	128
43.	Marks made with Composite Pencil, showing Sequence of Strokes	XV.	128
44.	Marks in Carbon Copy, shows absence of Striations	XV.	128
45.	Charred Fragments with Writing in Copying-Ink Pencil	XVI.	130

FIG.		PLATE	FACING PAGE
46.	Exhibits in Risley Case, Typewriting	XVI.	130
47.	Traced Signatures in Rice-Patrick Case	—	146
48.	Diagram of Locard's Method of "Graphometry"	—	149
49.	Locard's Method of Measuring Angles	—	151
50.	Locard's Method of Measuring Relative Angles	—	150
51.	Photograph of Picture of "Crucifixion"	XVII.	156
52.	Radiograph of the same Picture	XVII.	156
53.	Picture restored according to the Radiograph	XVII.	156
54.	Portrait of a Flemish Woman	XVIII.	158
55.	Radiograph of the same Picture, showing an Earlier Painting	XVIII.	158
56.	Painting representing Peasants Dancing	XIX.	160
57.	Radiograph of the same Picture	XX.	162
58.	Portrait of Queen Elizabeth at about 17	XXI.	166
59.	Portrait of Queen Elizabeth at about 30	XXII.	164
60.	Portrait of Queen Elizabeth at about 60	XXI.	166
61.	Pailou's Composite Portrait of Mary Queen of Scots	XXII.	164
62.	Portion of the "Scandal Letter" sent to Queen Elizabeth	XXIII.	168
63.	Admitted Writing of Mary Stuart	—	168
64.	Diagram comparing the "Scandal Letter" with the Admitted Writing of Mary	—	173
65.	Portion of the Third "Casket Letter" at Hatfield	—	176
66.	William Maitland of Lethington	XXIV.	176
67.	Portion of a Letter of William Maitland	XXIV.	176

CHAPTER I

EXPERT EVIDENCE

Everyone is familiar with the ancient gibe that witnesses may be classified into three groups—liars, damned liars, and expert witnesses, and there have been almost as many claimants for its authorship as for the invention of the battle-tank. Although the origin of the taunt is obscure, it is not difficult to understand how it has grown into a familiar quotation, to be used whenever expert evidence becomes a topic of general conversation.

The training of a specialist in any subject will often enable him to discover facts which would escape the notice of a casual observer, or to draw inferences from facts which would be meaningless until interpreted by specialised knowledge. It is only in exceptional cases, however, that facts carry such weight as in themselves to decide a point at issue, and, as a rule, only inferences of varying degrees of probability can be drawn from them. The well-worn saying that "facts cannot lie" is an obvious platitude, but they may be capable of more than one interpretation, each of which may even be partly true; and so it is an everyday occurrence for expert witnesses to support, in all good faith, conflicting opinions which may be based essentially upon the same facts.

Every profession has its share of the dishonest men in the world, and so unscrupulous witnesses may be found who are prepared to support any view, even when they know it to be contrary to the facts. Fortunately, this type of witness is now not frequently met with, at all events in this country, although he is by no means extinct.

The following instance, however, indicates that certain sections of the public are still under the impression that scientific evidence in support of either side of any case may be bought. A well-known chemist was asked to examine a consignment of tinplates which had been damaged by water, the question at issue being whether the injury was due to fresh water or to sea-water. In the former case, the loss would have been irrecoverable, whilst in the latter it would have been covered by marine insurance. The clerk who brought the tinplates to the chemist's laboratory remarked ingenuously: "We would rather that you found that it was damaged by sea-water."

Such a remark is also significant of the popular belief that advocacy comes within the scope of the expert witness, although his evidence should be concerned solely with the truth of certain facts without any reference to how they may affect any person.

On the other hand, it is recognised by everyone that the work of a counsel is to make out the best case for his client, even in the face of conflicting facts. In criminal cases he does this irrespective of the guilt or innocence of his client, even though he may have good reasons for believing him to be guilty. But it is going outside his province if he tries to impress upon the jury his personal belief in the innocence of the accused, for by so doing he is acting both as witness and as advocate.

A good illustration of this point is afforded by the now almost forgotten case of Courvoisier, who was tried in 1840 on the charge of having murdered Lord William Russell, to whom he was confidential valet. He was defended by Mr. Charles Phillipps, who at that time was the favourite counsel for the defence in criminal cases. After the second day of the trial, the prisoner, in an interview, made an admission which was not compatible with his innocence. Phillips thereupon sought an interview with one of the presiding judges, placed his dilemma before him, and asked for his advice. Naturally he was advised that he could not abandon the case without prejudicing the issue, which was still to be tried. When subsequently criticised in the Press for the part he had taken in the trial, he pleaded that he had been guided in his action by the advice of the judge.

On the following day he made a moving speech to the jury on behalf of the prisoner, in the course of which he made use on more than one occasion of expressions which implied that he personally believed his client to be innocent of the crime. Such an appeal, for example, as: "Supposing him to be guilty of the murder, which is known to Almighty God alone," was almost of the nature of false evidence, coming from a man to whom the prisoner had made what was tantamount to a confession of guilt.

On the other hand, it is essential that an expert witness should not go beyond the scope of the facts which he is in a position to prove, or of an impartial opinion based upon them. In criminal cases the innocence or guilt of an accused person has nothing to do with him in his capacity as witness, and any bias shown in either direction will weaken the force of his evidence.

Perhaps the most notorious instance in which open partisanship has been shown by expert witnesses was in the trial of a medical man named William Palmer for the murder of J. P. Cook, in 1856. The symptoms and appearances observed on the death of his victim indicated strychnine, and medical evidence was given to that effect. Taylor, the analyst for the Home Office, however, was unable to find any strychnine in the remains, but detected antimony. Evidence for the defence was given that if strychnine had been administered it should have been detected, and Taylor was accused of incompetence in using the methods he had employed for its detection. So acrimonious was the evidence on behalf of the prisoner, and so obviously inspired with the object of discrediting the whole of the scientific evidence for the prosecution, that the judge (Lord Campbell), in his summing-up, referred especially to "those gentlemen whose object was to procure an acquittal for the prisoner. It is," he continued, "in my opinion indispensable to the administration of justice that a witness should not be turned into an advocate, nor an advocate into a witness."

The position of an expert who finds that he has made a mistake is very different from that of an advocate who learns that he has been mistaken in his estimate of his client's position. No one will take exception to a counsel, continuing to conduct a defence under such circumstances so long as the facts are treated as part of his "case," and he does not express his personal opinion as to their truth, but the sole duty of the expert witness is to assist the court to understand the significance of certain facts, and hence a mistake in any essential point may falsify the whole of his evidence.

Mistakes in the observation of facts which are the premises for the conclusion are naturally much more vital than mistaken deductions, which cannot always be disproved, even when they are false, and that is one reason why the world judges more harshly the mistakes of observation than those of deduction. It was a frequent lament of Dr. Campbell Brown, a former Public Analyst for Liverpool, that a mistake made by an analyst was usually regarded as unpardonable. "A doctor," he said once, "makes a mistake and buries it. A clergyman makes a mistake, and it is only discovered in the next world. A lawyer makes a mistake, and is paid for it as highly as if he had not. But if an analyst makes a mistake he is condemned. He has committed the unpardonable sin. This popular view arises from the remains of the old idea that the chemist practises the black art. He is supposed to perform some simple, though mysterious, magic on a thing, and *presto*, he knows all about it. If he makes a mistake, that indicates that his magic is bad; he is not a true magician, but a false quack—away with him." That this is always the fate of a chemist who is at fault in his facts is disproved, however, by Campbell Brown himself, by the following instance within his experience:—An analyst who had expressed a certain opinion, upon which action had been taken, found before the hearing of the trial that, misled by a defective instrument, he had made a mistake. Although the solicitor on his side strongly urged him not to mention this mistake, but to allow the accused person to be acquitted as the result of a conflict of scientific evidence, he felt that he must be absolutely candid, no matter what the consequences might be to himself or his side. At the trial he at once admitted the mistake, and the case was dismissed with heavy costs against the prosecution. But, in spite of this, the ultimate result to the chemist was that for years afterwards his evidence was accepted as that of a man who was absolutely trustworthy.

In civil cases, especially those involving highly technical matters, where there may be two schools of opinion, expert evidence at times rather tends to develop into a parade of opposing authorities, and the position which a man has attained in the professional world may sometimes carry weight out of proportion to his experience in the special branch of his subject before the court.

In a case involving the question of reinforced concrete, an eminent architect, whose name was familiar to everyone, had given evidence on one side, whilst a young man, who was comparatively unknown, was called as a witness on the other. "And do you," asked the cross-examining counsel, "venture to set your opinion against that of Sir . . .?"

"Yes," replied the witness, "in this case I do, for I am much more familiar practically with the subject than he is."

Where, as in such a case, there is a conflict of opposing authorities, it is difficult for either a judge or a jury to decide where the truth probably lies, and much will then depend upon the way in which the counsel on either side can marshal the arguments for or against them.

The judge in trials has the power to call advisers in technical matters to his assistance, and advantage is not infrequently taken of this in the Admiralty Court, where it is not an unusual sight to see a naval officer sitting on the bench beside the judge to advise him on technical points.

In many respects it would be an advantage if this precedent were more widely followed in other courts. The legal mind often finds it difficult to follow the mode of expression of the scientific mind, and *vice-versa*, and so a summing up of the purely technical points, based on the view of an independent expert in the subject, would ensure due weight being given to the really important points in technical evidence. The need of some such independent review of the scientific evidence was recognised in the case of Smethurst, who, in 1859, was convicted of the murder of Isabella Banks.

After the trial, both the medical and chemical evidence, the main points of which are described on a subsequent page, was subjected to severe criticism, and the Home Secretary, acting on the advice of the judge, referred this portion of the evidence to Sir Benjamin Brodie for an independent opinion. The report of that distinguished medical man was that there were six reasons for believing the prisoner to be guilty, and eight for doubting that conclusion, and summarised the whole of the evidence in the following words: "I own that the impression on my mind is that there is not absolute and complete evidence of Smethurst's guilt."

Acting upon this balanced judgment, the Home Secretary advised that a pardon should be granted to Smethurst, who was accordingly released.

This innovation of a scientific referee after a trial does not appear to have been subsequently adopted, and in any case was a less satisfactory method of sifting such evidence than the presence of a scientific man upon the bench would have been, since it tended to make the referee take the place of the judge, while laying stress upon only one part of the evidence, which should have been reviewed as a whole.

At the present day there would be less objection to the appointment of a scientific referee, since his report would now be considered by the Court of Criminal Appeal in conjunction with all the other aspects of the case.

An interesting and probably unique instance of the decision of a judge being based largely upon the opinion of an expert is afforded by the Slingsby case, which was tried in 1915. The petitioner, who was a child of four, endeavoured through his guardians to establish the fact that he was legitimate and consequently entitled to the succession to large estates in Yorkshire. On the other side, however, it was asserted that he was not the son of Mrs. Slingsby, but that she had procured a baby from an outside source, which was indicated, and had palmed it off as her own.

During the trial the well-known sculptor, Sir George Frampton, was invited by the judge to be present on the bench, so that he might study the faces of the child and his reputed parents, and he came to the conclusion that the numerous points of likeness indicated that the boy was their offspring.

There was much conflict of evidence as to the origin of the baby, and, in holding that the child was legitimate, the judge laid considerable stress upon the facial resemblances which had been pointed out by Sir George Frampton, and which he, the judge, regarded as "conclusive." This judgment was reversed by the Court of Appeal, which decided that the child was not legitimate, and incidentally criticised adversely the value of the opinion based upon facial similarities. Finally, the case was carried to the House of Lords, where the claim of the petitioner was again unanimously rejected. Lord Loreburn remarked that the calling of Sir George Frampton was "obviously irregular and did not seem to carry much weight," and Lord Shaw was still more emphatic in his criticisms, in the course of which he said: "Evidence as to the likeness of the child to Mr. and Mrs. Slingsby was worthless. That class of evidence, except in the case of a difference of colour, had in Scotland been rejected for more than a century, on the grounds that it was loose and fanciful. In England it was open to the same objection."

An echo of this case was heard in King's Bench Divisional Court (Nov. 9, 1921), when an appeal was made against a maintenance order made by the Burnley magistrates.

Counsel for the appellant, who was a soldier, contended that there was no corroborative evidence of paternity, and that the fact that his client had said nothing when told that the baby was like him was no evidence against him.

Mr. Justice Darling observed that it had been laid down that what the soldier said was not evidence. This was what the soldier did not say. They could well imagine what a soldier would say when confronted with a baby and told that it was his.

Counsel then related a story of a magistrate who made an order against a man on the ground that the child was the living image of its father. A solicitor stated, however, that the father was not in court. "Oh yes he is," returned the magistrate, "he is sitting next to you."

"No," replied the solicitor, "that is my clerk."

"In fact," observed counsel, "babies at a young age are like nothing on earth."

In dismissing the appeal, Mr. Justice Darling remarked that a man who is asked to look at a baby and say whom it is like is in an extremely difficult position.

The most recent instance of evidence of this kind being given in the High Court was in the much-discussed Russell case, in which an attempt was made to prove the paternity of the baby by a comparison with the photographs of Mr. Russell at about the same age. Mrs. Russell, in the course of her evidence, stated that her baby closely resembled the photographs of her husband when a baby. Several of his photographs were like her baby's. "My baby," she continued, "appears to be at a disadvantage, for my baby has no hair, and John Russell at an early age appears to have masses of hair."

In cross-examination she was shown three photographs, and asked whether she saw any likeness to her baby. "Yes," she replied, "there is a general likeness about the ears and face."

To which Counsel replied: "Do you know that those are three photographs of stranger children taken at haphazard?"

The judge (Mr. Justice Hill), referring to this incident in his summing up, remarked: "I will say a word to you about the suggested resemblance of the child to the petitioner. You remember that photographs were called for, and you saw the photographs and saw the child. In my view, any conclusion drawn from the likeness or unlikeness of the child to the petitioner, whether in general or in the shape of the ears and the colour of the eyes, and so forth, would be very unsafe and conjectural. Science is only groping to find out the laws which govern the transmission of likeness from generation to generation.*

---

* Dr. A. M. Gossage (*J. Soc. Arts*, 1923, 71, 382) has given an outline of the evolution of scientific methods of determining whether a certain child could be the child of certain parents. He points out that, while there is no positive method of stating that it is the child of certain parents, there is a method of deciding whether it could or could not be the child of certain parents. For instance, it is known that two parents with blue eyes cannot have a child with brown eyes, although two parents with brown eyes may have a child with blue eyes. Again, two parents with red hair will produce children with red hair, but a red-haired child may occur sporadically among people with less highly-coloured hair.

But we can bring it to a much homelier test. All of you who have children must be familiar with the endless discussions which arise whether the baby is like its father or its mother, its grandfather or its grandmother. You will remember that questions were put to the respondent about photographs which were said to be photographs of babies not connected with the Russell family, and she found resemblances to her baby in them. I can't stop your considering this question of likeness, but I myself regard it as a dangerous guide."

It will thus be seen that everything directly or indirectly associated with man may become the subject of expert evidence. Questions involving details of specialised knowledge are of everyday occurrence in the Law Courts, and so witnesses have been called to express opinions upon all manner of subjects—from microbes to earthquakes, from the effect of strain on metals to dual personality in man. Even the insignificant house-fly, formerly looked upon as a harmless nuisance, has had its expert witness. In a case which was brought before the High Court a few years ago, an injunction was sought against the owners of certain manure heaps, on the ground that they were responsible for a plague of flies. There was some conflict of medical evidence, but a witness for the defence proved that flies confine their roaming within a radius of a mile from their home, and that since the complainant's house was much further away than that, the flies could not possibly have come from the heaps in question.

Objections are sometimes brought against expert evidence as a whole on the grounds that it is circumstantial in its character, and therefore of less value than the evidence of direct witnesses. The two kinds of evidence, however, should be considered as mutually interdependent, and it entirely depends upon the circumstances of the case which may be the more valuable.

As will be shown in the following chapter, the evidence of the eye-witness is particularly liable to be erroneous, especially in cases of identification, but is greatly strengthened when collateral circumstances also point to the same conclusion. Apart from the fallability of the evidence of the senses, there can be no eye-witnesses of many evil deeds, since the forger or the murderer does not advertise the fact that he intends to commit a crime unless he happens to be insane, and often it is only by the correlation of all the surrounding facts that it is possible to prove with as much certainty as is possible in human affairs the truth in a particular case.

Unfortunate errors of judgment and wrongful convictions have occurred in the past, and will still occur in the future, but those in which the miscarriage of justice has been shown to have been caused by mistaken identification outnumber beyond all comparison those in which it has been traced to a wrong link in the chain of circumstances.

CHAPTER II

EVIDENCE OF IDENTITY

THE world contains some four hundred millions of people, and, notwithstanding the infinite variety of human features, it may be regarded as a practical certainty that there is hardly anyone alive to-day who could not be taken for someone else, even when the two faces and forms were somewhat closely compared, whilst in the uncritical generalisation of a hasty glance numerous people might be mistaken for any given man or woman.

Everyone has, at some time or other, seen the "double" of someone else in an unexpected place, but the freaks of chance are so remarkable in the affairs of men that it has sometimes happened that two such "doubles" have been in the same place and at about the time when one of them has committed some crime, and the consequences of the coincidence have been disastrous to the other.

Mistakes of identification have probably been a more fruitful cause of miscarriages of justice than all the other causes put together. Every work on the laws of evidence cites notorious instances of the kind to prove how liable to error the direct evidence of eye-witnesses may be.

In a trial for burglary in the early years of last century the judge, in his remarks to the jury, pointed out that the evidence of the identification of the prisoner had been questioned, and recalled a case in which, when at the bar, he had prosecuted a woman for stealing a child. She had been identified as a person seen in shops in London and elsewhere by no fewer than eleven witnesses, and had been convicted. Subsequently it was found that a mistake had been made, and another woman was identified as the child-stealer with equal certainty by thirteen witnesses. "These contradictions," commented the judge, "make one tremble at the consequences of relying on evidence of this nature unsupported by other proof."

It would not be difficult to compile a long list of similar victims of mistaken identification, some of whom have afterwards received a "free pardon" for an offence which they never committed, whilst in other cases the error has been discovered too late. Many of these cases have long been forgotten, but others are still fairly fresh in the public memory.

A remarkable instance was that known as the Gorse Hall mystery in November, 1909. A wealthy mill-owner, living at Gorse Hall, in a lonely part of Cheshire, was stabbed to death by a man who had forced his way into the house. A relative of the deceased, named Howard, was identified by several witnesses as the assailant, and was tried in March, 1910, but he was able to prove conclusively that he was elsewhere at that time. In September of the following year another ex-soldier, named Wilde, was put upon his trial for the same offence, and he too was identified as the assailant by some of the same witnesses who had previously been positive that Howard was the man. One of these witnesses, a servant, was asked:

"If you saw Howard and this prisoner standing side by side, would you be able to distinguish one from the other?" "No," she replied, "they are so much alike, and one might possibly pass for the other." The two men, accused and acquitted, were then placed side by side, and the witness was asked to explain the difference between them. After a careful scrutiny she said: "I think they are very much alike."

In further cross-examination this witness admitted that she would not now go so far as she did at the first trial and say: "This is the man."

Notwithstanding many facts of a circumstantial character, this doubt as to the identification of the prisoner with the murderer resulted in his acquittal.

Another comparatively recent case is that of William Thompson, who, in 1912, was convicted of false pretences at the Essex Assizes, and also at the Middlesex Assizes, and sentenced at the first trial to eighteen months' hard labour, and at the second to three years' penal servitude. Against these sentences he appealed on the ground of wrong identification. He had been positively identified by twenty-two witnesses, but he proved that they were all mistaken, and that the real culprit was a man named Russell, who had absconded. This man was known to the police, who had his photograph, and were in a position to state that the likeness between the two men was close enough to deceive people. The evidence on these points and the difference in the handwriting of the two men led the Court to quash the sentence.

In this case it was largely the existence of a Court of Criminal Appeal which prevented one more innocent man from being wrongly imprisoned, but at the time of the most notorious case of all, that of Adolf Beck, there was no such Court of Appeal, and it was only through the accident of a postponement of sentence that Beck escaped a second imprisonment after serving the sentence for the first wrongful conviction.

The story of this strange confusion in the identity of two men begins in the year 1877, when a man named James Smith was sentenced to five years' imprisonment for obtaining money by false pretences from a number of women. In 1895 complaints were made to the police that a man, posing as Lord Willoughby de Winton, was extracting money from women by pretending to engage them as his housekeeper, and then disappearing with any sums which he could persuade them to lend him.

Towards the end of that year one of the dupes of this man saw Beck in Victoria Street, and promptly gave him in charge as the bogus nobleman. At the police-station fifteen out of seventeen women identified him as the man who had robbed them, although one woman was quite positive that he was not the man of whom she had complained.

In addition to this evidence of personal identification, the handwriting of Beck resembled that in letters written by the swindler, and the result of this cumulative evidence was that Beck was sentenced to seven years' penal servitude.

After serving five years of his sentence he was released on licence in 1901. Three years later complaints of similar swindles were once more received by the police. Beck was again arrested, and, as before, was positively identified—this time by nineteen women. He was again tried and convicted a second time, but the judge postponed sentence until the following sessions. In the meantime a man who passed by the name of William Thomas was arrested on a charge of swindling in a similar way. His writing upon pawn tickets relating to rings which he had obtained from the women agreed in character with that upon the documents which had been produced at Beck's first trial in 1896.

This made it seem probable that a terrible blunder had taken place, and this was proved to be the case when witnesses who had sworn that Beck was the man who had swindled them now admitted that they were wrong, and that they had mistaken him for Thomas.

The woman who had been unable to identify Beck in 1896 also gave evidence that Thomas was the man who had stolen her money, and the circle of identification was completed by a witness who proved that Thomas had been a lodger of his in 1877 when convicted under the name of John Smith.

There could thus be no question that an innocent man had twice been the victim of mistaken identification, and, although it was not possible to make any real amends, public opinion expressed itself so strongly that a grant of £5000 was made to Beck as some compensation for his suffering.

Mistakes in identification have not only been the cause of the conviction of scores of innocent people, but have also on many occasions led to the escape of the guilty. One of the most striking instances of the kind is given by Serjeant Ballantine in the reminiscences of his life. The housekeeper in a large house near Hastings was brutally murdered one Sunday morning while the family and most of the servants were at church. Suspicion fell upon a man who had come down from London the previous day, and he was arrested. Several witnesses swore that they had seen him near the house, some of the stolen property was traced to him, and the whole of the attendant circumstances indicated that he was the murderer.

The prosecution, however, brought forward witnesses to prove that he had also been seen the previous evening at a neighbouring village. The village postman swore positively that he had talked to him for half an hour, and had accompanied him to a publichouse, and two or three other witnesses corroborated this evidence. Not only were they absolutely certain about his appearance, but they had also recognised the tone of his voice when they had heard him speak before the magistrates. Serjeant Ballantine, who was defending the accused, then asked a man in court to stand beside the prisoner in the dock, and the postman was directed to look at the two men. They were exactly alike. The postman stared at them in amazement, and was absolutely overcome. At length he gasped: "I don't know which is the man." It was then proved beyond all doubt that it was really this second man whom the postman had met, and that, by a strange coincidence, he had come down from London by the same train as the prisoner.

As a result of this mistake the jury acquitted the prisoner within five minutes without leaving the box, although neither the judge who tried the case, nor Serjeant Ballantine, who defended him, had the smallest doubt as to his being guilty.

If the observations of eye-witnesses under the best conditions are thus liable to such gross mistakes, the chances of error are enormously increased when the identification has been based upon a momentary glimpse in defective light, or upon a single trait, such as a characteristic walk.

In the case of Wood, who in 1907 was found not guilty of the murder of a woman, it was proved that the accused had been in the company of the victim not long before the crime had been committed, and evidence was given that he had been seen in the same street in the early dawn of that day.

The witness who had given this evidence had picked the prisoner out from a number of men of similar build, who had been made to parade round the police station yard, and had identified him by a distinctive movement of the shoulder. But the value of this evidence was entirely discounted when counsel for the defence (Sir E. Marshall Hall) produced a man who lived in the same street, who also had a distinctive swing of the shoulder, and who was accustomed to leave home every morning at an early hour to go to his work.

There can be little doubt that the imagination has sometimes supplied details which could not possibly have been noted with the light available. In the year 1799 a man named Haines was tried on the charge of shooting at Bow Street officers. It was a dark night, but one of the officers swore that the flash of light from the pistol enabled him to see that the prisoner wore a rough brown overcoat and was riding a dark brown horse which had a square head and thick shoulders, and that he had since identified the same horse among fifty other horses. This evidence was received as satisfactory.

A still more remarkable instance of flash-light identification is afforded by the case of Brook, who, in 1813, was tried for burglary at York. The prisoner was identified by a witness, who swore that the man who came into his room in the night had struck the stone floor with "something like a sword," and that the flash thus produced had enabled him to see that the intruder was a large man, wearing a dark-coloured coat, and that his face was streaked with black. From these facts, and the resemblance of the voice, he believed the prisoner to be the man.

In 1839 a man named White was tried at the Croydon Assizes on the charge of shooting at and wounding a gentleman who was driving home in his gig on a dark night. This witness stated that he was at once able to recognise the features of the prisoner by the light of the flash of the gun. In cross-examination he said he was quite sure he could see him, and that he was not mistaken as to the identity. In this case, however, the accused was skilfully defended, and the jury did not consider the evidence of identification sufficient.

Since the possibility of identification under such conditions is obviously a question for expert investigation, it is interesting to follow the attempts which have been made to determine it experimentally.

In 1809 a man was condemned for murder in France, mainly on the evidence of two witnesses, who swore that they had recognised him by the light of a flash from a gun. Doubts being raised as to the justice of the verdict, the question was referred to the class of physical sciences, who came to the conclusion that such identification was not possible.

Desgranges of Lyons, however, made experiments under varying conditions, from which he concluded that on a very dark night a person who had fired a gun might be identified, provided the distance was not very great, the flash not very bright, and the smoke not too dense. A similar series of experiments was made in 1840 in connection with the trial of a man for shooting at a young woman. She claimed that she had recognised the accused as her assailant by the flash of the gun, but from the results of the tests, at which the prisoner's counsel was present, the conclusion was drawn that "all stories of recognition from the flash of a gun or pistol must be founded upon a fallacy."

On the other hand, Dr. Taylor, in his *Medical Jurisprudence* (1844), summarising the evidence on this question, concluded that "there can be no doubt that an assailant may by this be occasionally identified."

Even if this comes within the range of possibility, however, the danger of a mistake is too great for much weight to be given to such evidence.

Indirect evidence of identification may be of the widest scope. Footprints coinciding with those of an accused person, fragments of clothing of material corresponding with that worn by him, laundry marks on linen, and similar circumstantial details, have frequently proved important factors in completing the identification of a suspect, and such evidence is often given by experts. In the previous chapter some account was given of recent attempts to establish identity by drawing an inference from the resemblance between a child and his reputed parents, and it was related that the decision of several judges upon this question was that evidence of this kind, even when given by a trained expert, was of too fanciful nature to be of any value.

A particularly interesting instance of such circumstantial evidence, which was to some extent of a direct character, was that put forward at the trial of a labourer named Chant, at the Hants Assizes at Winchester, in 1913. The prisoner was charged with having set fire to a hayrick. The outbreak was discovered at ten o'clock at night, and about two hours later the police bloodhounds were brought to the burning stack. Not far from the spot they picked up a trail, which they followed by a somewhat devious course until they reached the back door of the prisoner's house. Chant was called up and placed with four other men, and the dogs at once picked him out.

The accused pleaded not guilty, and stated that he was at home when the fire broke out, but it was proved that he had left a publichouse shortly before the fire and had not reached home until afterwards. Counsel for the defence urged that the evidence of the hounds was not admissible, and that the evidence of their trainer was no more than hearsay. He contended that no such evidence had ever been admitted in any English court.

The Commissioner (Mr. Radcliffe) considered that the evidence of the hounds was most valuable, but that at the utmost it did no more than show that the prisoner had been near the rick. There was not enough other evidence to connect him with the arson, and he therefore directed the jury to acquit him.

The invention of photography placed a new weapon in the hands of the police authorities for establishing the identity of a "wanted" person. In many a case it has led to the detection of a criminal who was trying to escape from justice, but, on the other hand, it is not proof against an efficient disguise, and the registration files now kept by the police in all the big cities of the world show many instances of men who have so disguised their features as to be quite unrecognisable on casual comparison with an earlier photograph.

Moreover, since a photograph represents only one aspect, and often a false one, of a person at a particular moment, there is a chance of its being mistaken for a portrait of someone else, who in reality is not at all similar, and the possibility of wrong identification may thus be intensified. There have, as a matter of fact, been numerous cases of mistaken identification from photographs, one of the most remarkable of which is that described in the next chapter.

Notwithstanding the glaring errors which were shown to have resulted from reliance being placed upon the identification of criminals from old photographs, the system was vigorously defended in 1887 and 1888 in Parliament by the Home Secretary as being quite sufficient for the purpose, and it was not until 1894 that any further advance was made. In that year a Special Committee recommended that the French anthropometric system was the most suitable for preliminary classification, but that for more detailed grouping the finger print method gave the best results. A combination of the two methods was, therefore, adopted, and continued in use until 1901, when it was replaced by the system of finger print identification.

The system of identification of bodily measurements was invented by Bertillon, and was employed as the official method of registration in Paris in 1882. Seven years later it was claimed by Bertillon that there had not been a single case of mistaken identity since its introduction, and that in the previous year no fewer than 31,849 prisoners had been measured, 615 of whom had thus been recognised as former convicts.

In Bertillon's system twelve typical measurements, including the height, length and width of the head, length of the middle finger, of the foot, and so on, are made with standard instruments, and the figures are recorded upon a card, upon which are also pasted full face and profile photographs of the prisoner. By this means the photographs may be classified into groups of those of short, medium and tall men, and these again into short, medium and long heads, and further subdivisions are effected by the measurements of the width of the head, width of the outstretched arms, and so on.

In recording the colour of the eyes, which affords the means for further differentiation, a standard scale

LIBRARY, COLLEGE OF POLICE SCIENCE

is used, the figures in which correspond with the intensity of the pigment of the iris. These seven groups comprise: (1) Iris, azure blue with areola pale, but free from yellow pigment; (2) iris, blue or slate, with light yellow areola; (3) same shade, with larger areola, approaching orange; (4) iris, greenish reflection, hazel areola; (5) same shade with dark hazel areola; (6) hazel distributed over surface of iris; (7) eye entirely hazel.

One drawback to this method of identification is that an allowance must be made for errors in the measurements. In the United States Army, where a similar method of registration was adopted, this allowance was fixed at one inch in either direction from the recorded height, and the influence of natural variations in the course of years was also taken into consideration in comparing the measurements.

Although this method was a great advance upon any previous system of identification, it is by no means infallible, and there have been numerous instances where the recorded measurements have led to mistakes.

Probably the most striking case of the kind which has ever occurred is that of the two negroes, each named Will West, whose portraits are shown in the accompanying figures * (Figs. 1 and 2, Plate I).

In 1903 one of these men was committed to the United States Penitentiary at Leavenworth, Kansas, and a few days later was photographed (Fig. 1) and his measurements taken. The record clerk, thinking that

---

* Reproduced from *Personal Identification*, by H. H. Wilder and Bert Wentworth, by the kind permission of Mr. R. G. Badger.

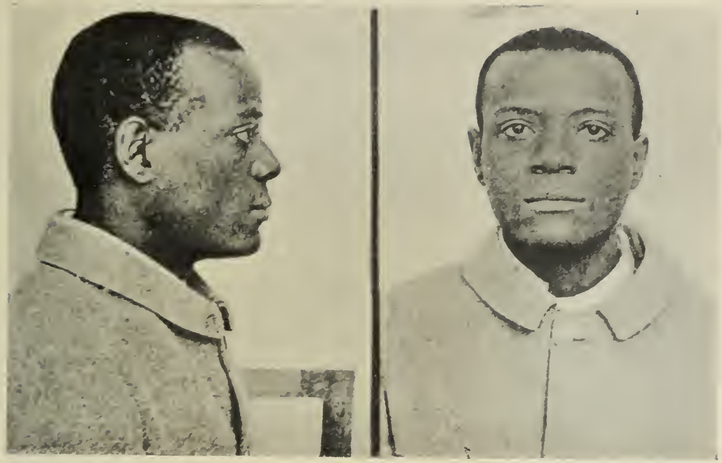


Fig. 1.

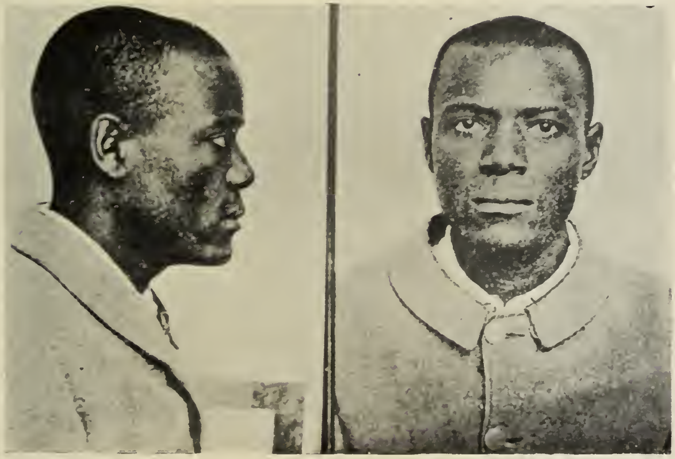


Fig. 2.

Plate I. Portraits of the Two Will Wests.

[By permission of Mr. R. G. Badger.

To face page 26.]

he remembered the face, remarked: "You have been here before." "No, sir," was the reply; but the clerk, still unconvinced, compared the measurements which he had just made with his record file, and produced a card with an accompanying photograph (Fig. 2) marked "William West."

The prisoner stared in amazement at what he believed to be his portrait, and then exclaimed: "That's my picture right enough, but I don't know how you got it, for I know I have never been here before." The clerk then read the details on the back of the card, from which it appeared that the original of the photograph was at that very moment a prisoner in this penitentiary, serving a life sentence for a murder committed in 1901.

It was then found that there were two Will Wests under the roof of the same prison, each of whom showed practically the same Bertillon measurements, and had faces so closely similar that it was almost impossible to distinguish the two men apart. (See, however, their finger prints, Figs 12 and 13.)

This unique series of coincidences affords convincing evidence that the scientific measurements of the human frame cannot be accepted as absolute proof of identity, even when they corroborate the evidence of an eye-witness or of the camera.

The same remark applies to the identification of a person from fragmentary remains of the body, with the exception of such as show skin patterns, although, under certain conditions, the expert evidence drawn from such a source may be of the utmost value in confirmation of other evidence also incomplete in itself.

In the notorious Crippen case the wife of the accused had mysteriously disappeared, and different conflicting reasons to explain her absence had been given. Finally Crippen took to flight, and when his house was searched, human remains were discovered buried in lime beneath the bricks of the cellar, but it was not possible to identify these absolutely as having been part of the missing woman.

Evidence was given, however, by Dr. Pepper, that the marks upon a fragment of skin were due to a scar from an operation, and, although this opinion was at first disputed by medical witnesses for the defence, these witnesses finally agreed that this conclusion was correct. It was also proved that the wife of the prisoner had undergone an operation which would have produced such a scar, and these facts, in conjunction with the other medical evidence, greatly increased the degree of probability that the remains were those of the supposed victim.

To the same class of evidence belong the expert conclusions of dentists, whose work makes them familiar with the distinctive characteristics of a large number of people.

In the well-known American case of Professor Webster, who was tried for the murder of Dr. Parkman in 1849, the body of the victim had been almost completely consumed in a laboratory furnace, but a block of artificial teeth was discovered in the ashes of the furnace, and was positively identified by a dentist as that which he had made three years previously for Dr. Parkman.

By a strange coincidence a murder was brought home to another Dr. Webster, a well-known Chicago physician, in 1912, in a similar manner, the victim being identified by a gold tooth which the prisoner had overlooked when he had mutilated her beyond recognition and had buried the body in a remote wood.

A more recent instance of the value of identification by the teeth occurred in 1917, when the body of a young woman was found floating off Brooklyn Pier. The body had been in the water for upwards of eight months, but the bridge-work in the mouth was traced to the dentist who had made it. He was able to give the address of the girl's mother, and she identified the body with certainty.

Indirect dental evidence has also, on several occasions, furnished a clue leading to the identification of a wanted but unknown person. Gross cites the case of a banker who was murdered in Petrograd. Near the body was a cigar holder with an amber mouthpiece, on which were two indentations, apparently made by teeth of unequal length. The teeth of the murdered man did not show this irregularity, but those of his nephew did, and these facts led to the arrest of the nephew.

Similar expert evidence was given in 1911 at a trial at Leicester, when a man was charged with the murder of a woman. The victim had been ferociously attacked with great brutality, and there were teeth marks on the body. A piece of blotting paper, upon which the teeth marks of the accused had been taken, was produced, and a medical man gave evidence that the general curves of the marks corresponded with those upon the body, and that in each case there was a gap in the impressions due to a missing tooth.

The proof of identity in such a case as this is of about the same value as that based upon the points of coincidence between a footprint and a boot, and the weight which will be attached to it will naturally vary with the attendant circumstances.

In the case of William Richardson, tried in 1787 at Dumfries, a girl was found murdered in a farm house, and there was no reason for suspicion falling upon any particular person. Near the house there was a bog crossed by stepping stones, and at one point a footprint was observed, which indicated that someone had slipped off one of the stones in crossing the bog. Measurements of this footprint were taken, the farm hands were called together, and their boots compared in turn with the measurements. The only boot which exactly coincided with the impression in size, shape of the sole, and the number and position of the nails, was that of Richardson, and it was noticed at the time that he showed great agitation while these comparisons were being made. Subsequently the house where he lived was searched, and hidden away was found a pair of stockings with mud upon them, identical in character with that of the bog adjoining the cottage. The prisoner asserted that he had been at work in the fields all that day, but it was proved that he had been absent for about half an hour on the pretext of seeing a smith, which was long enough for him to have run to the cottage, murdered the girl, and hurried back again to his work. He was found guilty, and, prior to his execution, confessed that he had committed the murder, the motive being to conceal the fact that the girl, who was half-witted, was about to bear a child.

As a more recent example of footprints being produced as evidence of identification, a case tried in December, 1921, at Lytham, may be mentioned. A man was accused of stealing fowls, and as evidence that he was the culprit a square of turf containing the imprints of a foot was shown in court, and it was demonstrated to the magistrate that the prints of the nails and clog irons coincided with the nails and fittings on the clogs of the prisoner. Had the imprints been those of a naked foot, it might have been possible to establish the identity of a suspect from the impression alone with more certainty than was otherwise possible.

When Jezebel was thrown to the dogs, and they went to bury her, they found no more of her than the skull and the feet and the palms of her hands, so that no man could say: "This is Jezebel." But, as Sir Francis Galton remarked, it was by the soles of the feet and palms of the hands, and by them alone, that it would have been possible to identify the body of Jezebel with absolute certainty.

The practice of tattooing is fairly widespread among certain classes of the community, especially sailors, among whom it has probably found favour as a means of identification in case of death by drowning.

Although numerous patterns are thus indelibly pricked into the skin, they cannot be regarded as sufficiently distinctive to be accepted as positive evidence of identification, except perhaps in some few instances. Not only can the more simple stock patterns be repeated on different persons, but anyone possessing a photograph of a particular tattoo mark could, if necessary, produce a similar pattern.

Even the elaborate design upon the skin of the Japanese labourer, who was drawn by Dr. Faulds in Japan, and is reproduced here by his permission (Frontispiece), could conceivably be copied, although the task would not be an easy one, for every square inch of the body was thus adorned.

Apart from this possibility of imitating tattooed patterns, there is the further objection to their value as absolutely conclusive evidence that it is possible by chemical treatment to remove them, to some extent at all events, or to conceal them by a second pattern of a different design. It will thus be seen that tattoo marks may or may not afford evidence of identification, according to the particular circumstances.

The knowledge and skill of the artist has of recent years been applied, with very striking results, to the problem of identifying human beings by a restoration of the features upon a skull, and a most interesting outline of the work done in this connection will be found in the *Personal Identification* of Messrs. Wilder and Wentworthy, to whom the writer is indebted for many details and illustrations of the method.

Essentially, the principle adopted is that used many years ago by Sir Richard Owen in reproducing the forms of prehistoric monsters from their fossilised skeletons; but with this difference, that, whereas Owen's allowance for the depth of the flesh upon the bones was based upon a comparison with measurements made upon animals of other species still extant, the restoration of the face upon a skull has been based upon average measurements of the depth of the flesh upon the human skull, that is to say, upon the same species. These measurements are accurately made at definite points upon the face, and the results have been tabulated for the skulls of the different races of mankind, for there are pronounced differences between the figures applicable to, say, the European and Mongolian races.

By strictly following the appropriate average measurements a trained sculptor can build up in a plastic material upon a plaster cast of a skull, a reproduction of the face, which, within the limits of the method, will resemble the features of the original living person.

Obviously, the method cannot reproduce the exact form of the nose or show wrinkles and lines in the skin formed by the action of the muscles—characteristics to which the expression of personality owes a good deal, and this drawback seems to be insuperable, yet, after every allowance has been made for this limitation, the results obtained in test experiments have been sufficiently conclusive to justify the use of the method in unknown cases.

One of the earliest trials of this means of identification was in 1895, when it was used to ascertain the identity of the skull of Bach, the musician.

Bach, who died in 1750, was buried in a church in Leipzic, and when, some 28 years ago, this church was being repaired, it was decided to transfer the remains to a more worthy monument.

The difficulty was that it was no longer possible to say which of several possible skeletons was that of Bach, but ultimately by a study of the burial records, the choice was narrowed down to two, one that of a woman. A cast of the skull of the man's skull was accordingly made and submitted, together with the average measurements mentioned above, to a sculptor, who was thus enabled to reconstruct, upon the cast, features which showed a sufficiently close resemblance to those of Bach to solve the problem of his identification.

At the same time, as Messrs. Wilder and Wentworth point out, this test was not entirely free from possible bias, for Bach's features were well known, and the sculptor must have had a shrewd suspicion as to the identity of the skull.

Another early application of the method was that made by Professor Wilder to restore the features of one of the sun-dried mummies of the prehistoric cave-dwellers of Utah. By cautiously soaking the head in a very dilute solution of potash the skin was rendered elastic again, so that it swelled up and gave some idea of the form of the original features. The skull was then prepared, and a plaster cast of it submitted to a sculptor, who, with the aid of the average measurements and the information obtained by the preliminary chemical treatment of the head, was able to model upon the cast the features of a face which must have closely resembled those of the woman who had lived in the cave centuries earlier (see Fig. 3, Plate III).

It was not until 1913, that an opportunity arose of making a practical test of the value of this method

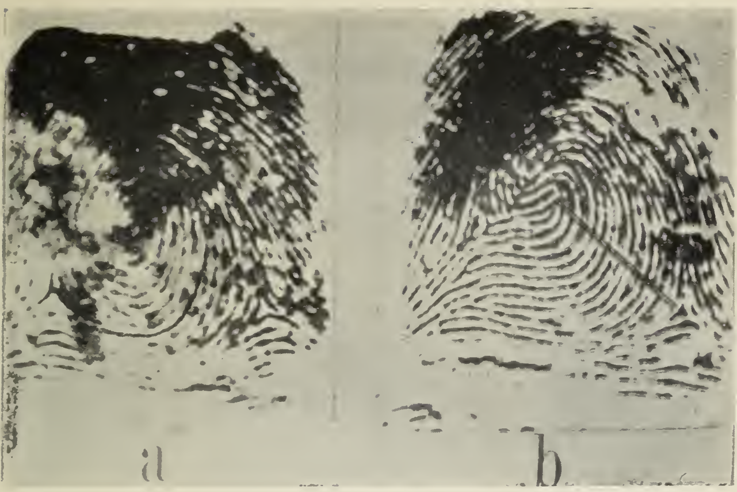


Fig. 12. Fig. 13.

Plate II. Enlarged Finger Prints of the Two Will Wests.

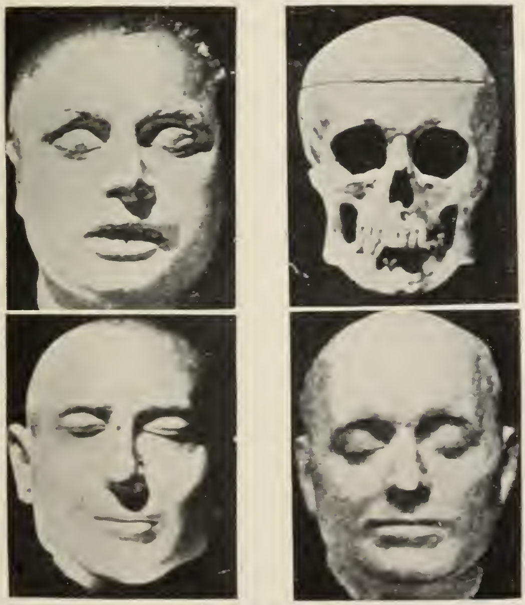


Fig. 4. Fig. 5.

Fig. 6. Fig. 7

Plate II. Restoration of Skull of a Criminal.

Fig. 4—Original Face. Fig. 5—The Skull. Figs. 6 and 7—Restorations.

[By permission of Mr. R. G. Badger.

To face page 34.]

Fig. 11.

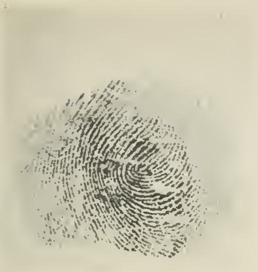


Plate IV. Finger Print of Dr. H. Faulds. Feb., 1923.

Fig. 9.

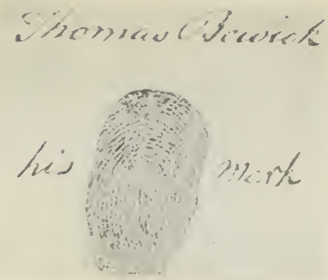


Plate IV. Finger Print of Thomas Bewick.

Fig. 10.

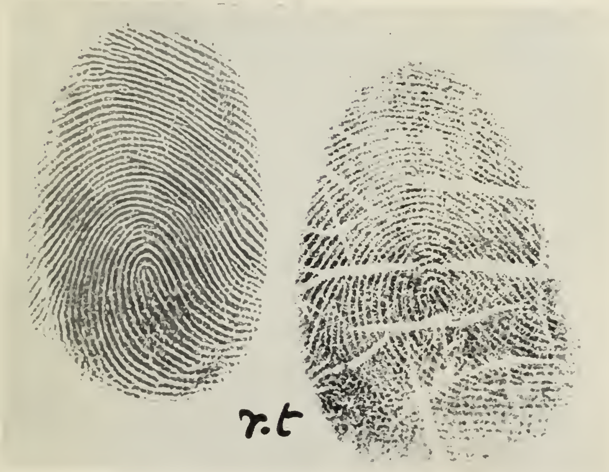


Plate IV. Enlarged Thumb Prints of Sir W. Hercshel in 1856 and 1914.

Fig. 19.

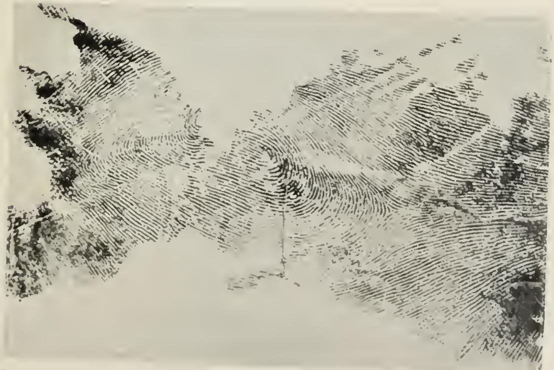


Plate IV. Heel Print showing Calcar Pattern.

[*By permission of Professor Wilder.*

under conditions in which the features of the original person could not possibly be known to the sculptors, and yet had been recorded. For the purpose of the experiment, plaster casts were made from the skull of a criminal who had been executed at Jena, and these were submitted, together with the usual average measurements, to two well-known sculptors—a man and a woman. The results are shown in the accompanying figures in comparison with a plaster cast of the original face. The woman did not keep to the exact measurements given to her, and her reproduction is therefore more unlike the original than is the work of the other sculptor (Fig. 6).

The first occasion on which this method has proved of service in criminal work was in discovering the identity of a man supposed to have been murdered. A skeleton was found in 1916 in the cellar of a house in New York, and, with the exception of the fact that his clothes indicated that he was probably an Italian workman, there was no clue to his identity. An attempt was therefore made to reconstruct the features in plasticine on the assumption of Italian nationality, and a wig of the same colour as hair still attached to the skull was made up and brown glass eyes were fixed in the eye sockets, whilst a neck to fit the workman's tie was constructed (Fig. 8, Plate III).

Shortly afterwards another skeleton was discovered not far away, and in the pocket of the coat was some writing, from which the identity of the man—also an Italian—was discovered.

There was nothing to connect the second victim with the first, except the fact that both were presumably Italians, but the officer in charge of the investigation, drawing a bow at a venture, showed the reconstructed head of the first man to the friends of the second.

They immediately recognised it as an old friend, Dominick la Rosa, although one of them suggested that the cheeks were not full enough; when this was corrected they said it was exactly like their lost friend. One of them remarked, "Dominick had two gold teeth," and tried to open the plasticine lips to see them. The presence of these teeth had, of course, been noted when the skeleton had been discovered, and this detail afforded corroboration of the identity of the missing man.

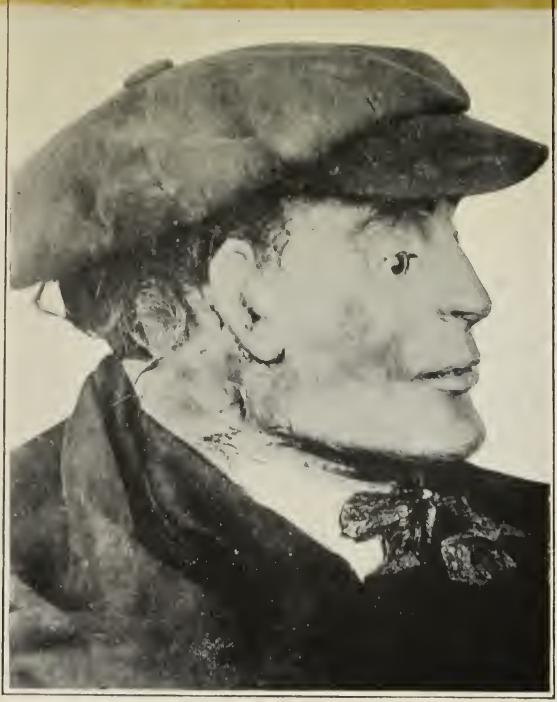


Fig. 8.

PLATE III. SKULL OF DOMINICK LA ROSA AFTER RESTORATION BY MR. GRANT WILLIAMS AND MESSRS. PUCINI, OF THE NEW YORK POLICE DEPARTMENT.

By permission of Mr. B. Wentworth.

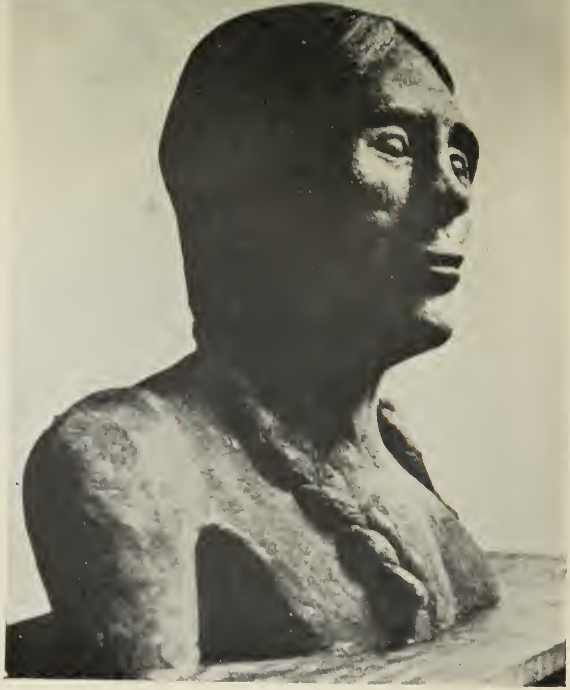


Fig. 3.

PLATE III. RESTORATION OF THE HEAD OF PREHISTORIC CAVE WOMAN BY PROFESSOR WILDER.

[*By permission of Mr. R. G. Badger.*

To face page 36.]

CHAPTER III

IDENTIFICATION OF SKIN PRINTS

SINCE the evidence of eye-witnesses or the inferences drawn from such methods as those described in the last chapter can never afford absolute proof of identity, the discovery of the possibility of using the distinctive patterns on the friction skin for this purpose is one of the most valuable contributions of science to the ends of justice.

So much has now been written upon the nature of finger prints and the methods of classifying them into distinctive types, that the elements of the subject will be familiar to most people*, but the evolution of the idea, the evidence that the system is absolutely trustworthy, recent methods of detecting accidental prints, and the work that has been done in connection with the analogous patterns on the soles of the feet and with the pores on the finger ridges are as yet but little known.

It is frequently stated in the newspapers that Bertillon invented the system of identification by finger prints, but this is quite erroneous. At first Bertillon regarded the process as unworkable, and it was only after a long time that he recognised the value of the idea, and adopted it as an adjunct to his system of body measurements.

---

* A brief non-technical outline is given in my *Science and the Criminal.*

It is interesting to note how close to the actual discovery of the individuality of finger patterns some of those who first observed their peculiarities must have been.

Bewick, the engraver, for example, frequently used the imprint of his finger as a sign manual in his books, and he could hardly fail to have noticed that he had engraved a distinctive pattern. Examples of such signatures are to be seen in his *British Birds* (1809) and *The Receipt* (1818), the latter of which is reproduced here by the permission of Sir William Herschel (see Fig. 9, Plate IV.). Apparently there is no evidence that Bewick ever realised that in this pictorial signature he was leaving the most permanent record of his identity that he could have devised.

The first attempt to clasify these patterns of the skin appears to have been made by Purkenje, who was subsequently Professor of Anatomy in the University of Breslau. In 1823 he submitted a thesis in Latin for the degree of Doctor of Medicine, in which he dealt with the examination of the cutaneous system, and referred to the "marvellous grouping and curvings of the minute furrows associated with the organ of touch upon the inner surface of the hand and foot, and, in particular, upon the extreme phalanx of each finger."

There are still a few copies of this rare treatise in existence, but at the time when Galton was first studying the subject, there was no copy to be found in England, and it was only after a long search that one was discovered on the Continent. This copy is now in the library of the Royal College of Surgeons in

London. Although it is shown in this paper that the patterns made by the furrows differ widely in form, and that they may be classified into groups, no attempt is made to use these differences as a means of establishing the identity of a person or of distinguishing him from the rest of the world. It was not until fifty-seven years later that there was any further publication on the subject of finger prints. In that year Dr. Henry Faulds wrote a letter, which appeared in *Nature*, in which he described the results of his systematic investigations upon the individuality and persistence of finger prints, and suggested the various uses to which the system might be put, such as, for example, the tracking of a criminal by the accidental imprints which he had left behind him.

As it happened the use of the method as a means of proving the identity of human beings had also occurred to Sir William Herschel, and had actually been officially used by him in India for some years from 1858, although it had subsequently been abandoned Hence, when Dr. Faulds published his communication, he had the misfortune to find that he had been forestalled in certain parts of his discovery, but the systematic experiments which he had made on all branches of the subject entitle him to be regarded as a joint inventor of the system.

The circumstances have much in common with those in connection with the publication of the theory of natural selection. Here, too, the same idea had independently been worked out by Darwin and by Russel Wallace, and the former was about to read his paper before a scientific society when he received the manuscript from Russel Wallace, who was abroad, with a letter asking him to publish the paper. Both papers were read upon the same occasion, and hence the theory became known by the names of the two men.

Sir William Herschel's original aim in causing the natives in India to make an imprint upon a document was to render the transaction more solemn. A similar sort of ceremonial act was already in use among them, the signature to a document being attested by the tip of the finger being dipped into the ink-pot and then applied to the paper, so as to leave a smudge, which was termed a *tep-sai*.

Subsequently the remarkable differences in the various imprints struck Sir William Herschel, and led him to introduce the method as an official system of identification, although he did not publish anything on the subject until after the appearance of Dr. Faulds' communication in *Nature*.

Dr. Faulds had written to Darwin asking for his assistance in the investigation, and Darwin had referred him to his cousin Sir Francis Galton as being the most likely person to help him. Two years later Galton began to study the subject, more particularly with regard to the individuality of finger prints and the methods of classifying them, and published several books on the use of finger prints and methods of deciphering blurred and imperfect prints.

These men, Faulds, Herschel and Galton, may be regarded as the pioneers in the development of the new system, and later workers have adapted, modified and extended their work, so that the finger print method has now become the recognised means of identification all over the world.

The persistence of finger prints throughout life has now been established beyond all question. The pattern areas may become distorted, but the patterns will still remain the same, just as a piece of lace (to use Galton's comparison) may be pulled out of shape, but still keep the pattern.

The longest record of persistence is afforded by the prints shown in Fig. 10, Plate IV, which were sent to the writer by Sir William Herschel in 1914, with permission to reproduce them. The earlier print was made in India in 1856, and the later in 1914, and it will be noticed that, although the ridges show the disintegration due to age, the patterns are essentially the same. A repeat of the second print was sent in 1916, shortly before Sir William's death, and for many years to come these prints must hold the record for age.

I am also able to give a specimen of the finger print of Dr. Faulds, the other discoverer of the finger-print method, made in February of this year at my request (Fig. 11, Plate IV). Dr. Faulds informs me, that his record for immutability of pattern goes back as far as 1879.

The evidence as to the individuality of finger prints has gradually accumulated until it may now be regarded as a matter of certainty, but for a considerable time the courts were very chary about accepting it as conclusive. For example, in 1908, a man named Chadwick was charged with burglary at Birmingham. The burglar had left several imprints upon a champagne bottle, and evidence was given that these coincided in no less than twelve of the ridges with the finger prints of the prisoner. The judge, however, did not regard the evidence as satisfactory, and advised the jury not to accept it. But, notwithstanding these doubts of the judge, the jury found the prisoner guilty.

In 1911 the admissibility of finger prints as evidence was raised in the Illinois Court as the result of the trial of a negro named Thomas Jennings on a charge of murder. It was alleged that the prisoner had broken into a house in Chicago, and had shot its occupant, and then escaped through a window. The porch rail of the house at the back had been recently painted, and impressions of the fingers of some person were noted upon the fresh paint. These were found to agree in 33 points with the finger prints of the prisoner, and it was mainly upon this evidence that he was convicted. The verdict was upheld on appeal to the Supreme Court of Illinois, which held "That there is a scientific basis for the system of finger print identification, and that the Courts are justified in admitting this class of evidence."

Instances of the value of the method in proving the innocence of an accused person are cited by Messrs. Wilder and Wentworth.* In one of these cases a man was arrested in 1911 on the charge of murdering several people with an axe. Blood prints of the murderer's fingers had been left upon the handle of the axe, but these were so different from the finger prints of the accused that he was immediately released.

In 1910 the infallibility of the system was called in question in a case tried at Highgate. A police officer gave evidence that the prisoner had previously been sentenced for an offence, but the prisoner brought evidence to show that he was in the army at that time, and therefore could not have been the man in question. He was discharged, but subsequently evidence was obtained which corroborated the evidence of identity from the finger prints.

---

* *Personal Identification*, p. 291.

In a more recent case, tried at the Old Bailey in 1916, Andrew Scarloli was convicted of breaking into Sadlers Wells Theatre and stealing £43 in Treasury notes. Evidence was given that his finger prints coincided in 32 ridge details with imprints upon the glass of a broken window at the theatre.

"You don't think it possible," said the judge, "that two persons could produce the same lines?"

"Impossible," replied the officer.

Then, with the prisoner's consent, prints of his fingers were taken in court, and these, together with those previously exhibited, were handed to the jury for comparison. Although the prisoner denied that he had committed the robbery, the jury were satisfied with the evidence of identification, and convicted him.

The ridge patterns on the skins are not only unchangeable, but also cannot be permanently removed by any means short of complete mutilation of the finger or hand. This was clearly proved by a series of experiments made by Dr. Faulds in Japan. He rubbed the finger with pumice stone until the patterns were no longer to be seen, but in each case the ridges recurred in exactly the same form with the growth of the skin. Similarly, after the destruction of the skin by burning or its peeling after fever, the new skin will show the same patterns as the old.

Criminals, unaware of this power of the skin to renew its original characteristics, have sometimes attempted to prevent their finger prints being taken by lacerating the surface of their fingers, their object being to obtain a lighter sentence by concealing the fact that they were old offenders.

Sir Melville McNaghten, in his *Days of my Years*, mentions an instance of the kind, where a man, while being taken to prison, in the prison van completely excoriated his finger tips by means of the metal tag of a bootlace. For the time being this prevented his finger prints being taken, but in the long run it availed him nothing, for his sentence was postponed until after the skin had healed, when his finger prints were taken, and he was recognised as an old offender.

No more striking example of the superiority of the finger print method over all other systems of identification can be found than that afforded by the case of two negroes named Will West, mentioned in the previous chapter. Although neither photograph nor scientific body measurements were capable of distinguishing between these two men apart, their finger prints were quite different, and afforded an absolute proof of their respective identities (Figs. 12 and 13, Plate II.).

The following incident also illustrates the efficiency of the method. Some years ago the present writer published an account of the finger print system, and by way of illustrating the different types reproduced the prints of the thumbs and fingers of the right hands of several people, including those of a lady who happened to be present. As the original imprint of the third finger was not very clear, he substituted for it the print of the corresponding finger of the left hand. Some time later this lady was staying with Sir William Herschel, and, noticing the book upon his shelves, remarked that it contained her finger prints, although she did not know which they were. Sir William Herschel thereupon made fresh prints from her fingers, and soon discovered the particular set, but naturally found that the third fingers did not agree, and it was only when he came to compare the imprints from the other hand that he saw what had happened. "This," as he wrote to the present writer, "is all to the credit of the system."

The usual method of developing accidental finger prints upon polished surfaces such as furniture or glass windows is by the application of a fine powder, such as magnesium carbonate, graphite or an aniline dye, the excess of which is afterwards blown or dusted off, leaving the pattern of the ridges outlined in the powder. This method of development is practically certain at any time after the imprint was made if the surface was highly polished, but upon a fabric such as paper which is not highly sized, is only applicable for a short time.

Another method of developing latent prints upon paper is by the use of a suitable ink, as first suggested by Dr. Forgeot. Imprints are usually more or less greasy from the natural oil of the skin, and so when lightly brushed with ink, repel the liquid at those points where the skin has been in contact with the paper, and leave a visible print in which the furrows and the pores on the ridges will be stained, while the ridges themselves will be colourless.

Figs. 14 and 15, Plate V., represent latent prints on paper developed in this way, that developed with Swan ink having remained practically invisible for more than three years.

The use of reagents in the form of vapour is often much more satisfactory than that of either powders or liquids, and some of these reagents have the advantage of being applicable without destroying the paper. Iodine vapour, for instance, will develop a finger print very sharply for many months after it was left on paper, but has the drawback of being fugitive, so that the developed print will soon fade again. On the other hand, the vapour of osmic acid, as first suggested by the writer for this purpose, leaves a permanent stain, but is much less sensitive than iodine vapour, which will detect finger prints upon paper for long after they have ceased to give any reaction with osmic acid. Fig. 16, Plate V.. shows that the osmic acid method will reveal the finest detail in an imprint, and is therefore particularly suitable for the examination of the pores in finger marks on paper.

This recent extension of the finger print method, which is known as "poroscopy," is largely due to the work of Dr. Locard, Director of the Police Laboratory at Lyons, and has enormously increased the value of the system as a method of identification. It is commonly accepted that an accidental print must be of sufficient extent to show at least twelve points of agreement between its ridges and those of another print

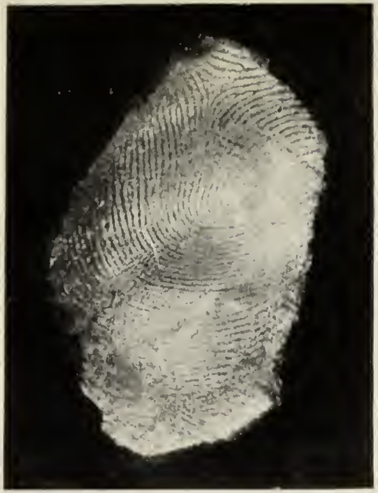


Fig. 14.

Plate V. Latent Finger Print Developed with "Swan" Ink after Three Years.

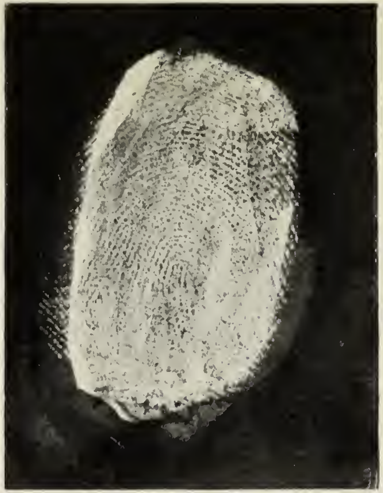


Fig. 15.

Plate V. Latent Print Developed with Osmium Pyrogallate.

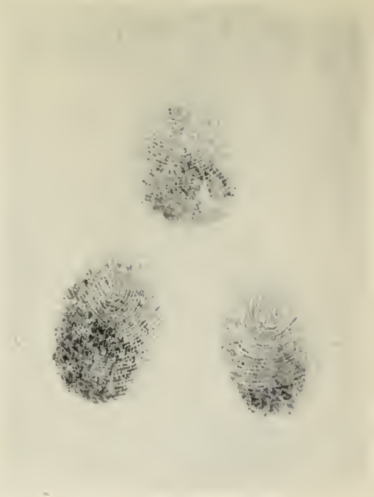


Fig. 16.

Plate V. Latent Prints Developed with Osmic Acid Vapour.

To face page 46.]

before it is safe to regard the proof of identity as conclusive. This rule is a somewhat arbitrary one, for it is obvious that agreement in a smaller number of lines in the core of a rare pattern might be more conclusive than the coincidence of a much larger number of ridges from the less distinctive area of a pattern.

It has now been proved, however, that the pore openings upon the ridges are distinctive in size, shape and position, that they vary as widely as do the patterns themselves in the case of different individuals, and that they are equally permanent. Since the number of pores ranges from about nine to twenty-eight per square centimetre, it will be seen that the points of agreement between two prints may in some cases reach thousands, and may afford a proof of identity which could not otherwise be attained when only a few ridge markings are available for the comparison. The method, moreover, is applicable not only to the marks left by the finger tips, but also to imprints from the entire palm of the hand.

The value of this new method has already been shown in numerous cases in France, for the account of which, and for the illustrations of the prints of Boudet, the writer has to thank Dr. Locard.

In June, 1912, a burglary occurred at a house in Lyons, a sum of money and a good deal of jewellery being stolen. There was no witness and none of the ordinary indications of the identity of the burglars, but it was noticed that the rosewood box in which the jewellery had been kept was covered with finger prints. These were coloured by the powder method and photographed, and it was then found that they coincided with those of a man named Boudet, who had previously been convicted for theft, and it was also recorded that he was in the habit of working with an associate named Simonin. The latter was therefore also arrested, and it was then discovered that all the imprints on the box which were not those of Boudet had been made by Simonin. At the trial it was demonstrated to the jury that the middle finger of Boudet's left hand showed 901 pores, which coincided exactly with one of the imprints on the box (see Fig 17, Plate VI.), whilst a print taken from the palm of Simonin's left hand contained no fewer than 2000 points of agreement with another print upon the box. Both men were sentenced to five years' hard labour.

In another case, in January, 1915, a house in Lyons was broken into through a window. On the broken glass finger prints were discovered which coincided with those of a man named Dorey, who had already been convicted for a similar offence. One of the imprints showed 21 points and another 16 points of agreement, but the others were only fragmentary; these, however, contained numerous pores by which their identity could be established.

In the case of similar burglary in November, 1912, it was shown that in one imprint alone of those left on a window pane, there were more than 400 pores agreeing in all respects with those in the imprint of a Spaniard named Matieu, who had been accused of the crime, and a second print showed 200 points of agreement. Confronted with this evidence, Matieu pleaded guilty, and was sentenced to a term of imprisonment.

A still more remarkable triumph for the new method

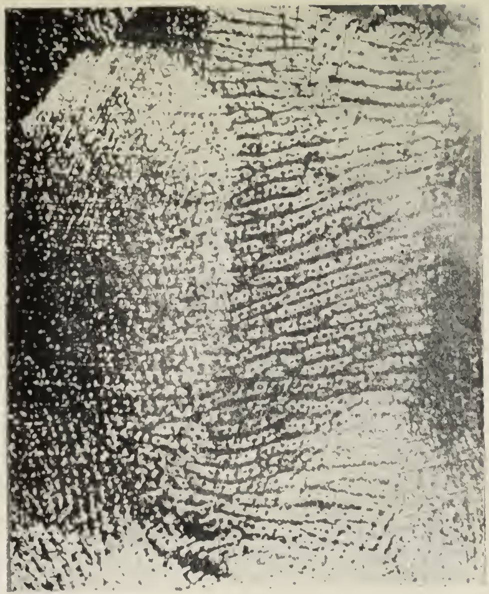


Fig. 17.

Plate VI. Imprints of Burglars' Hands on a Box. Identified by the Pores.

[*By permission of Dr. Locard.*

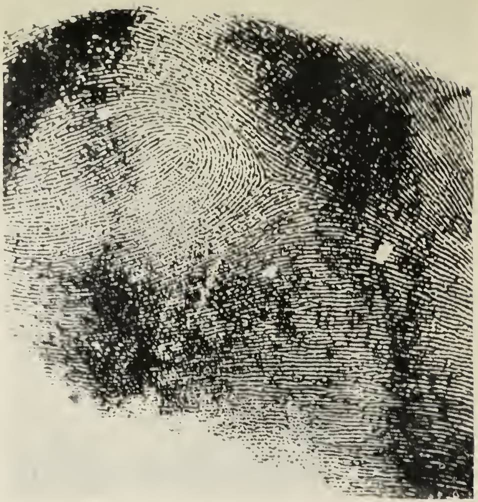


Fig. 20.

Plate VI. Heel Print of American Woman showing Rare Calcar Pattern.

[*By permission of Professor Wilder.*

To face page 48.]

is recorded by Dr. Locard. Now that the spread of scientific knowledge has extended even to the professional burglar, it is not unusual to hear of housebreakers covering their hands to prevent any tell-tale prints being left behind. This precaution was taken by a man who, in January, 1912, broke into a tavern in Lyons, stole several bottles of wine, and drank from others on the spot. Notwithstanding the fact that he had protected his fingers with a "honeycomb" towel, which he had found on the premises, he left an imprint in which there were 22 distinctive ridge markings and many characteristic pores. Another fragmentary imprint showing only seven bifurcations, but numerous pores, was also found on one of the empty bottles, and these were identified as originating from a man named Sabot. He was able to prove, however, that he was somewhere else at the time the theft was committed, and to give a satisfactory explanation of how he had come to handle the empty bottles subsequently.

SOLE PRINTS. The friction skin upon the soles of the feet, like that upon the palms of the hands, shows ridges which form distinctive patterns and are, therefore, capable of being used as proofs of the identity of the individual.

In European countries boots are too extensively worn for this characteristic to be of much general use for this purpose, but in Eastern countries, where a large proportion of the population goes bare-foot, record of the prints made by the soles might frequently prove as valuable as the now generally adopted systems of finger prints have done.

The patterns upon the feet, unlike those upon the hand, extend beyond the actual soles, so that the whole of the characteristic markings are not shown within the area covered by the tread. The latter portion of the markings, however, is that which would be shown in an accidental footprint, and hence any system of classifying the patterns should include the tread area.

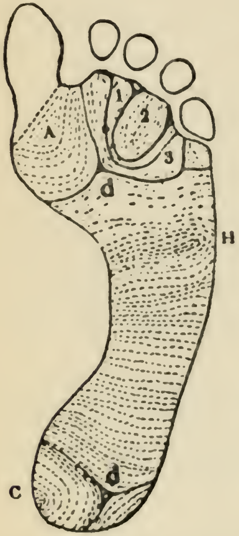


Fig. 18.

Tread area of boy's foot showing calcar and fibular patterns.

By permission of Mr. R. G. Badger.]

The most complete study of the sole patterns is that made by Wilder and Wentworth (*Personal Identification*, p. 159), who have shown that various portions of the footprint might be used for the purpose of differentiation and classification, but that the system which so far appears to be the most simple and comprehensive is that which is based upon the patterns upon the ball of the great toe and upon the areas at the base of the other toes.

The outline of the tread area of a boy's foot is shown in Fig. 18, by permission of Messrs. Wilder and Wentworth. This shows the three areas at the base of the toes upon which the classification of patterns is based. It also shows the somewhat rare *fibular pattern*, h, at the side of the sole, and an example of the very rare pattern on the heel, or *calcar pattern*, of which only about a dozen instances in all have been recorded. As Messrs. Wilder and Wentworth remark, the owner of a calcar pattern is a marked man, and such sole prints should be kept in a separate class.

Professor Wilder has kindly sent the writer actual prints of two of the known instances of calcar patterns. The first of these (Fig. 19, Plate IV.) is the print taken from the heel of an American professor, and is particularly interesting in that it shows a complete loop.

The other example (Fig. 20, Plate VI.) is a print taken from the heel of an American lady.

It should be mentioned that the method of sole print identification has now been adopted in the Chicago Lying-In Hospital for recording the identity of babies, for it has been found that it is much easier to take a print from the soles of a baby than from its finger tips.

Interesting biological questions are associated with the origin of the patterns formed by the friction ridges of the skin. In lower animals, such as the field mouse, the pads on the feet show only concentric oval patterns, which would be of little use for the purpose of identification. Similarly, in the case of the lower monkey, most of the patterns in the hands are concentric whorls, and it is only exceptionally that a pattern is found degenerating from a whorl into a loop. The suggestion which has been made, therefore, is that these friction ridges in their complete form of whorls are associated with the sensitiveness of grasp required by a monkey, whereas in the case of the higher apes and of man the whorls have degenerated into loops, arches and complex patterns through want of use.

It would be useless to look for any distinctive patterns in the foot pads of an animal such as a cow, but it has recently been demonstrated that it is possible to identify cows by the imprints of their noses.

The patterns formed by the ridges carrying the sweat pores are of a somewhat simple character, and do not lend themselves readily to classification, but they appear to be quite distinctive even in the cases of cows of the same parentage.

One of the first prints made in this country is shown in Fig. 21, Plate VII. It was taken by the writer in February, 1923, from the nose of a Jersey cow belonging to Mr. Ernest Matthews; obviously it shows a very distinctive pattern in the arrangement of the ridges. and the pores. It now remains to be proved whether the patterns remain unchanged over a period of many months; and, at the request of the Royal Agricultural Society, the writer has made a series of prints from the noses of six cows which will be compared with the prints taken from the same cows some months hence.

The pattern formed by the ridges of a dog's nose is shown in Fig. 22. Its curious network-like structure appears to be very characteristic. A pig's nose, on the other hand, shows no distinctive ridges, although the sweat pores are grouped differently in different animals (see Fig. 23, Plate VII.).

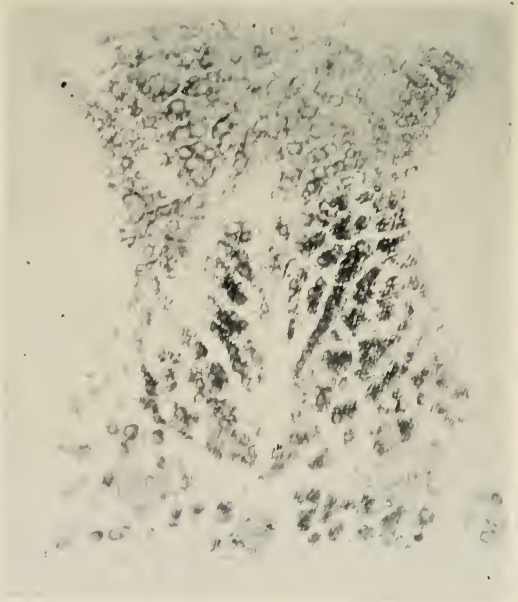


Fig. 21.

Plate VII. Nose Print of Full Grown Jersey Cow.

To face page 52.]

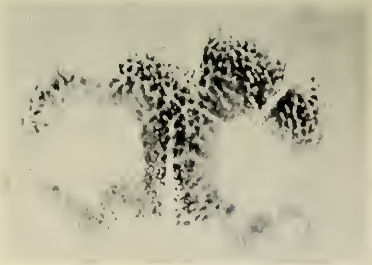


Fig. 22.

Plate VII. Nose Print of Sheep Dog.

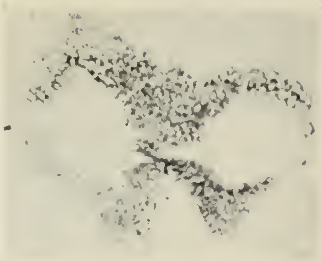


Fig. 23.

Plate VII. Nose Print of Young Pig.

CHAPTER IV

Medical Evidence

With the possible exception of ministers of religion, the doctor is more intimately associated with every stage of our lives from their first hours to their last than the members of any other profession, and since spiritual injuries are not often made the subject of a lawsuit, medical men are more frequently to be seen in the law courts than any other class of expert witnesses. The nature of their evidence is almost as wide and as varied as the interests of human life. The succession to estates, marriage tangles, the degree of responsibility in criminal actions, the nature and extent of bodily injuries, the causes of death in obscure cases, and the identification of human remains, are only some of the questions which frequently have to be decided largely upon the medical evidence.

At one time the scope of the medical witness was even wider than it is to-day, for it included questions which are now dealt with by the chemist. Before the birth of chemistry as an exact science it was fitting that such chemical knowledge as there was should have been applied by the doctor in the isolation and identification of poisons, but such work is now recognised as a highly specialised branch of forensic chemistry. The medical man was also regarded as a specialist in the examination of water and the analysis of food, and until a comparatively recent date it was not unusual for the offices of Medical Officer of Health and Public Analyst to be held by one man, who in some cases had to become an "expert" in a subject which requires the study of a lifetime, by a few months' training in the laboratory of a chemist.

Even an expert knowledge of witchcraft was formerly expected of a doctor. The most notorious instance of the kind was at the trial of two women, Rose Cullender and Amy Duny, of Lowestoft, on the charge of bewitching children. It was sworn by different witnesses that these children would be suddenly afflicted by various complaints and as suddenly recover, and that, in particular, they would be attacked with fits, after each of which they would vomit crooked pins or nails with broad heads.

Other witnesses stated "that at the least touch of one of these supposed witches, Rose Cullender by name, the children would shriek out, opening their hands, which accident would not happen by the touch of any other person."

To test this, the judge, Sir Matthew Hale, directed one of the children to be blindfolded, and one of the witches to be brought near her, while another person touched the hand of the child, who immediately shrieked as though the witch had touched her. Whereupon the spectators openly declared that this was an imposture. But even the result of this test was used against these unfortunate women, it being suggested that the maid knew that the person who had wronged her was near.

Dr. Browne, of Norwich, better known to the world as Sir Thomas Browne, the author of *Religio Medici*, was asked during the trial to give his opinion upon the evidence, and stated that he considered that the persons were bewitched.

"There had been lately in Denmark," he stated, "a great discovery of witches, who used the very same way of afflicting persons by conveying pins into them, and crooked, as these pins were, with needles and nails. And his opinion was that the devil in such cases did work upon the bodies of men and women upon a natural foundation (that is) to stir up and excite such humours super-abounding in their bodies to a great excess, whereby he did in an extraordinary manner afflict them with such distempers as their bodies were most subject to, as particularly appeared in these children, for he conceived that these swooning fits were natural, and nothing else, but only heightened to a great excess by the subtlety of the devil co-operating with the witches at whose instances he doth these villanies."

It was largely in consequence of this evidence that the jury found both prisoners guilty, and they were subsequently executed, without making a confession.

Referring to the conduct of the judge in refusing to deal with the evidence in this trial, Lord Campbell wrote: "Hale was afraid of an acquittal or a pardon, lest countenance should be given to a disbelief in witchcraft, which he considered tantamount to a disbelief in Christianity."

In those days any illness which was not cured by the favourite remedy of bleeding was attributed either to poison or witchcraft, or both. Hence it was that the evidence of sorcery largely contributed to the conviction of Anne Turner in 1615, on the charge of murdering Sir Thomas Overbury, for there was no conclusive evidence that any poison had ever been given to him. It was sworn that the prisoner was in possession of parchments, some of which contained the names of the Blessed Trinity; others on which were written +B+C+D+E; and another with a figure, in which was inscribed the word "corpus," and to which was fastened a little piece of skin of a man. "In some of these parchments were the names of devils, who were conjured to torment the Lord Somerset and Sir A. Mainwaring if their loves should not continue—the one to the Countess and the other to Mrs. Turner."

As showing the very gradual decline in the belief in the reality of such practices, it may be mentioned that the last trial for witchcraft in England was at the Hertford Assizes in 1712, but that the statute making witchcraft a penal offence was not repealed in Ireland until 1821.

The question of spontaneous combustion, in all its aspects, was also formerly considered one for the medical man, but is now recognised as a matter which has to be decided upon chemical evidence, and several interesting cases of the kind are given in the following chapter. The possibility of the spontaneous combustion of the human body, however, although it was ultimately decided by physiological chemistry, was for long a subject of dispute among medical men, and so late as the middle of last century still had its supporters. It will be remembered what effective use of this sensational ending to a life was made by Dickens and by Marryat in their novels.

Taylor, in his *Medical Jurisprudence* (1844) contended that the hypothesis of those who advocated spontaneous human combustion was perfectly untenable. "So far as I have been enabled to examine this subject," he remarked, "there is not a single well-authenticated instance of such an event occurring. It is in vain that they who advocate this hypothesis appeal to the electrical state of the atmosphere, or of the individual, coupled with the impregnation of the system with the inflammable principles of alcohol, as conditions sufficiently explanatory of their views; such explanations may be reserved until the occurrence of this spontaneous combustion from internal causes is placed beyond all dispute."

It was the chemist Liebig who finally summarised the evidence on this disputed question in *Letters on Chemistry*, published in 1846.

The earliest recorded instance was in 1725, when a man named Millet was tried at Rheims for the murder of his wife, whose charred remains were found about 18 inches from the kitchen fire. There was motive alleged for the crime, but, owing to the evidence of medical men that there had been spontaneous combustion, the prisoner was acquitted.

During the next 120 years some forty-eight cases were recorded, but in most of these the victims were intoxicated and in rooms heated by open fireplaces or with pans of glowing charcoal, and none of the physicians who attempted to explain the cases had ever observed the process or ascertained the conditions immediately preceding the combustion. In the accounts of some of the cases it was generally asserted that the body entirely disappeared, leaving only a greasy stain on the floor and some small remains of bones, which was an obvious impossibility.

In 1843 a German doctor named Franck studied the evidence in forty-five cases, and concluded that in three of them spontaneous combustion was proved. In the most important of these, reported by an Italian surgeon named Battaglio in 1787, a priest at Filetto was left in his bedroom reading his prayer book, with a sackcloth between his shirt and his shoulders. A few minutes later a scream was heard, and he was found lying on the floor enveloped in a pale flame, which slowly receded as the observers approached, and finally disappeared.

The shirt was burned in places, and the body showed corresponding burns, but Franck omitted to record the fact that an oil lamp was burning in the room before the combustion, and afterwards was found to be empty, with its wick charred to ashes. Battaglio's conclusion, therefore, that in this case there was a peculiar kind of fire, differing from ordinary fire, was discounted by the fact of this oil lamp; nor did his statement that the priest's skull cap was entirely consumed without singeing the hair support any such inference.

As Liebig remarks: "Whatever may have been the state of health or disease of the priest's scalp, it is certain that the skull cap did not share in this state of health; it was not diseased, and had in itself no cause to break into flames; nor, if it did so, was there any reason why the flames should contain a fire different from all other kinds of fire, all of which burn hair."

And again, in summarising the evidence on the subject as a whole, he says, with dry humour: "If a cat be found burned to death in a room, no one will imagine that the fire has arisen from the spontaneous combustion of the cat, or suppose, because a cat's fur sometimes becomes electric by rubbing with the hand, that a disease exists among cats by which they become spontaneously combustible, yet this supposition is not more improbable than in the case of men. It may be said that cats drink no brandy; but the defenders of the theory admit that cases of spontaneous combustion also occur in persons not addicted to ardent spirits."

Since the publication of Liebig's attack there have been few who have ventured to defend the theory, and there is no record of any later trial where it has been put forward by medical witnesses for the defence.

Another strange error which was at one time strongly supported by medical opinion was that, if a living body were thrown into water it would sink, whereas a dead body would float.

This point was of primary importance at the trial of Spencer Cowper (grandfather of the poet), at the Hertford Assizes in 1699, on the charge of murdering a young gentlewoman named Sarah Stout. It was stated that at the previous Assizes Cowper, who was a barrister, had stayed at the house of Mrs. Stout, the mother of the alleged victim. A maid gave evidence that she had been told to prepare Mr. Cowper's bed, but that when she came downstairs again, he had gone out, presumably with Sarah Stout, who was never again seen alive. The next day her dead body was found floating on the river.

It was asserted by counsel for the Crown that there was conclusive proof that she had been strangled and then thrown into the water. "It is," he contended, "contrary to nature that any persons that drown themselves should float upon water. We have sufficient evidence that it is a thing that never was; if persons come alive into the water, then they sink; if dead then they swim."

This view was put forward by several local doctors, and by a number of London medical men who had been called in as expert witnesses, and their evidence was supported by two seamen of the Royal Navy, who were emphatic in their statement that a dead body thrown into the water would float.

Cowper skilfully cross-examined the medical witnesses, and made them admit that they had no knowledge of the way in which the body of a person who had drowned himself would behave. He produced witnesses to prove that any marks observed upon the body had been caused by contact with stones in the bed of the river.

As against the medical evidence for the prosecution, he called ten of the leading physicians of the day, including Sir Hans Sloane, whose evidence was to the effect that the appearance of the body was quite consistent with death by drowning.

Some of them also described experiments that they had made upon animals, the results of which showed that when a dead body was thrown into the water it sank at first and afterwards rose to the surface, and also that drowning could take place without much water being swallowed.

As a proof that the dead woman was of a melancholy temperament and likely to commit suicide, some letters of her's were read to the jury, but her mother and brother would not admit that these were genuine, since they did not consider them consistent with her disposition.

It is not surprising that the judge, Sir Henry Hatsell, should have been greatly puzzled by all this contradictory evidence, or that he should have informed the jury that "doctors do differ in their notions about these things." He made no attempt to guide the jury through the tangle, and they, accepting the medical evidence for the defence, acquitted the prisoner.

It is, of course, now a matter of common knowledge that a body, whether living or dead, will at first sink if thrown into water, but Cowper undoubtedly owed his life to the fact that he had sufficient influence to be able to bring forward such weighty evidence to rebut the medical evidence for the Crown.

Unfortunately there is, as a rule, no single simple test for determining the point at issue in Cowper's trial, for the question has frequently been raised in later trials. A medical witness has to base his conclusions on various factors, such as the amount of water in different organs of the body, and whereas, individually, none of these may be absolutely conclusive, yet collectively they may afford practical certainty as to whether or no a person was drowned.

As a result of the cumulative character of such evidence, medical witnesses in criminal cases have sometimes been somewhat unfairly treated in cross-examination, counsel for the defence endeavouring to gain admissions from isolated facts which were not borne out by the evidence as a whole. In many cases no decisive conclusion can be drawn from the medical observations, and the question has then to be decided by the general circumstantial evidence. On the other hand, it is sometimes possible to infer with reasonable certainty that death was due to drowning, as when fragments of water weeds or sand similar to that at the bottom of the river or pond are still clutched by the hand.

An instance of this kind, which curiously recalls the Cowper case, occurred in 1843 at Maidstone. The body of a young woman was found floating in the Medway, and, owing to certain suspicious circumstances, a man was charged with having murdered her and then thrown the body into the river. Medical evidence was given, however, that there were no marks of violence upon the body, and that there were long strands of grass at the back of the mouth and in the throat, which were of the same kind as that growing in the bed of the river, but different from any vegetation upon the banks. As this indicated that the supposed victim must have been alive when she first came in contact with the water, and that it might therefore have been a case of suicide, the accused was discharged.

The same sort of difficulties frequently present themselves in cases of wounding or of death from wounds. A medical witness will be asked whether there is any reason to infer from the nature or position of the wounds that they have been self-inflicted, and the fate of a person accused of the supposed crime may largely depend upon the conclusions which have been drawn from the medical examination.

Under certain circumstances the facts may justify a conclusion with some degree of certainty. For instance, if a weapon is still firmly grasped in the hand of a dead man, it is reasonable to presume, in the absence of any conflicting evidence, that it was a case of suicide; and if the wounds are of such a character or in parts of the body where it would not have been possible for them to have been inflicted by the dead person, there can be but little doubt that a murder has been committed.

In many cases, however, the facts do not admit of such simple interpretation, and it then becomes a question of balancing the points for and against a particular view, and of expressing the conclusion in terms which will vary in their degree of probability with the circumstances. Even when a definite opinion cannot be expressed, certain details may have a value as circumstantial evidence when considered in association with other facts.

For example, in the case of Richardson, which was cited in the second chapter as an instance of circumstantial identification, medical witnesses stated that the wounds on the victim must have been inflicted by a left-handed person, and the fact that the accused admitted that he was left-handed was an additional link in the evidence.

Another instance of this kind is recorded in the

Life of Sir Astley Cooper. A man named Blight, living at Deptford, was found shot under circumstances which had been carefully planned to suggest that his house had been the scene of a burglary. From an examination of the wounds, however, Sir Astley Cooper concluded that the shots had been fired by someone who was left-handed, and this observation led to the arrest of a friend of the murdered man, named Patch, to whom no suspicion had previously attached. All the other circumstances were then found to agree with this supposition of his guilt, and in the end he was convicted. Prior to his execution he confessed that he was guilty of the crime.

Apart from the question of suicide, there is the possibility that wounds may have been self-inflicted with the idea of diverting suspicion about some other act. In such cases the injuries will usually be found comparatively light and in positions which are not vital.

A notorious instance of the kind was brought to light in 1839 at the trial of a man named Bolam, at Newcastle. He was found, apparently insensible, in a house which had been set on fire either by himself or by someone else. Close to him was lying the dead body of a man named Millot, and Bolam stated that they had both been the victims of housebreakers, who had subsequently set fire to the house. He was bleeding from a slight wound in the neck which, he said, had been inflicted by the men who had attacked them, but there were no signs of any injuries to his hands, such as were to be expected on those of a man who had attempted to protect himself against such attack. His coat and waistcoat also showed numerous slashes, but there were no indications of the slightest wound upon the body coinciding with any of the cuts through the cloth.

In view of these circumstances, the jury did not accept Bolam's explanation, and he was convicted of manslaughter.

Great as may sometimes be the difficulties in drawing conclusions from the appearance of visible wounds, such decisions are much less likely to be a subject for a conflict of opinion than questions as to the nature and extent of internal injuries in living persons. In such cases a medical man has to base his conclusions largely upon the subjective symptoms as described to him by the patient, and when that patient has a pecuniary interest in exaggerating those symptoms, a doctor may very easily be misled, especially when the tests which he can apply tend to support the statements made to him.

It is obvious that the uncertainty opens the way to fraudulent claims against railway or insurance companies, and so common did these become, that medical men were appointed by the companies to examine each claim in cases of accident, and, if necessary, to appear as witnesses on their behalf in opposition to the claims.

Certain parasites upon the profession have been known to make a practice of appearing regularly in support of the claimants in any accident, although their qualifications have been of the slightest description.

Serjeant Ballantine refers in his reminiscences to one of these paid advocates—a man who was so ignorant that he was unable to state what was the normal temperature of the body, and yet he had appeared as a witness in considerably more than a hundred accident cases.

Owing to such claims being particularly open to suspicion, and therefore subjected to severe criticism, it has not infrequently happened that miscarriages of justice have occurred. In one such case medical evidence in favour of a claim was not accepted largely owing to the manner of the claimant in the witness box. His alert mien and sprightly answer created such a bad impression in the minds of the judge and jury, that they regarded the account of his injuries as grossly exaggerated; but they were wrong, for within a few months the man died from the results of the accident.

On the other hand, a witness may be so skilful as not only to deceive his own doctors, but also to convince the medical experts opposed to his claim. In one case described by Serjeant Ballantine, a man who had been in an accident appeared in Court apparently in such a broken-down condition that he was the object of pity from every side, and his doctor gave evidence that he had completely lost all sense of feeling in his leg. He obtained very substantial compensation. Yet within a short time he was found mountaineering and none the worse for an experience that had provided him with a comfortable income for life.

There was no doubt that this man had succeeded in convincing his medical man that he did not feel the prick of a pin in his leg. Such tactics are not always successful, however, as was recently shown in a case at the Bow County Court. A doctor giving evidence described how a patient attempted to deceive him in this way by asserting that he had lost all sense of feeling in his arm. The witness told the man to turn his head away, close his eyes, and say "yes" when he felt the prick of a pin. The doctor pricked the arm three times, and the patient said "no" after each prick. This proved him to be a fraud, for had he really been unable to feel anything he would not have known of the pin-pricks, and would have said nothing.

A still more difficult medical problem, which comes to the fore after every notorious murder, is the question of insanity in criminal cases, and the degree of responsibility of the criminal. It is one of those questions upon which the legal and the scientific mind find it difficult to appreciate the other's point of view, and the experts themselves do not agree as to the precise meaning to be assigned to the different types of insanity.

In a trial in the early years of last century, Dr. Forbes Winslow (the elder), when asked for a definition of insanity, replied that it was impossible to give a comprehensive definition of all the varieties of that disease. The lawyer, thumping the desk with his fist, returned: "But I must insist on a definition."

The witness paused for a moment, and then poured forth a stream of psychological terms until the lawyer begged him to stop. "Dr. Winslow," he said, "do not continue further, for if you do we shall all become examples of that terrible complaint which you have so eloquently described."

The "legal test" for insanity, which is still regarded by many authorities as decisive, was enunciated in

1843 as the outcome of the acquittal of MacNaghten. In that case the prisoner was tried for the murder of a gentleman named Drummond, whom he had shot with a pistol in Parliament Street, having mistaken him for Sir Robert Peel. There was no dispute as to the facts, but the question to be decided was whether MacNaghten was of unsound mind at the time. The prisoner was defended by Mr. Cockburn (subsequently Lord Chief Justice), and the judge decided that the prisoner must be acquitted upon the ground of insanity. This verdict was followed by such a storm of popular indignation, that fourteen judges were called to the House of Lords to express their views upon the application of the law in criminal cases involving insanity.

In answer to the questions put to them, they laid down the dictum that "To establish a defence on the ground of insanity it must be clearly proved that at the time of committing the offence the party accused was labouring under such a defect of reason from defect of the mind as not to know the nature and quality of the act he was doing; or if he did know it, that he did not know he was doing what was wrong."

This definition of a consciousness of right or wrong has been subjected to adverse criticisms ever since it was made, and it is obvious that it does not enable a distinction to be drawn between an insane homicide and a sane criminal.

Many lunatics, for example, know the difference between right and wrong, and a striking instance of this was shown in the case of Ware, a patient in a lunatic asylum, who was tried in 1885 for the murder of another patient. The judge (Sir H. Hawkins) remarked: "It would be impossible to say that Ware did not know he had killed a man, because he said himself that he had, and it would be impossible for anyone to argue that he did not know it was wrong, for he wanted a promise that he should not be punished; but unless one put a totally different construction on the law, that would have to be proved, although no man in his senses would find Ware responsible for what he had done."

It is evident, therefore, that the legal test cannot be applied without modifications under certain circumstances, and that hence the whole question remains practically in the same state as it was before the MacNaghten judgment. Each case ought to be decided upon its merits without reference to legal definitions, whereas in practice there is a perennial conflict between the medical and the legal views. It is not easy for a lawyer to accept the medical view that insanity is not always accompanied by delusions, or that a man who is suffering from a certain disease may be aware that a particular act is wrong, and that he will be punished for it, and yet have an incontrollable impulse, which may or may not be the result of a delusion, to do that particular act.*

---

* The Medico-Psychological Association of Great Britain and Ireland has recently submitted a report on criminal responsibility to Lord Justice Atkin's Committee, who are considering whether any changes should be made in the existing law, practice and procedure relating to criminal trials in which a plea of insanity is raised as a defence. Among the conclusions recommended are:—(1) Legal criteria of responsibility as defined in the Rules in the MacNaghten case should be abrogated, and responsibility left to be determined by jury on merits of case. (2) In every trial in which the prisoner's mental condition is raised the Judge should

Moral insanity is not as yet recognised by the law, which regards such a condition as synonymous with extreme depravity, the possessor of which is to be held indubitably responsible for his actions.

This legal attitude may be illustrated by a recent decision. In January, 1921, a highly educated man was tried at the Old Bailey on the charge of forgery, and it was urged in defence that he had given way to drink, and fifteen years before had been confined in an asylum for six months, and that he now lacked a sense of responsibility. The medical witness called for the defence stated that in his opinion the prisoner was morally defective, and that he did not consider that he was able to distinguish between right and wrong. In cross-examination this witness admitted that it would be extraordinarily difficult to say whether the man when released from an asylum would be sane or insane. In his opinion, all people who committed a crime without having a strong practical motive for doing so were insane.

In passing a sentence of imprisonment the judge remarked that the theory that a man did not possess a sense of responsibility was one of which the law took no cognisance.

Moreover, conclusions drawn from the fact that no reasonable motive for an act can be discovered may be fallacious, for they assume that failure to discover such motive is tantamount to the absence of motive.

---

direct the jury to answer the following questions: (*a*) Did the prisoner commit the act alleged? (*b*) If he did, was he at the time insane? (*c*) If he was insane, had it nevertheless been proved to the satisfaction of the jury that his crime was unrelated to his mental disorder? (For full report, see *The Lancet*, April 7, 1923.)

In the trial of Courvoisier, previously mentioned, it was only the accidental discovery of the motive for the crime that convinced many people of his guilt, and one of the main arguments of his counsel was that "the absence of motive was the strongest proof of his innocence."

Some medical jurists go so far as to contend that the mere commission of a crime such as murder presupposes insanity, and that it is therefore not humane to punish a man for a deed for which he is not responsible. This doctrine, for which there is a good deal to be said, might logically be extended to many other offences against the law. If generally accepted by the community, it would involve a complete change in our methods of dealing with criminals, but such a revolution is not likely to take place until the medical and legal views of insanity have drawn much closer together.

CHAPTER V

THE EVIDENCE OF THE CHEMIST

THE doctrines of alchemy, which was the parent of chemistry, were so closely bound up with the practice of healing the body that it is not surprising that the development of the modern science should have owed much to the work of medical men, or that most of the early chemists should have been doctors. As a natural consequence of this, chemical evidence, as distinguished from alchemical speculation, was first given by medical men, since it was regarded as a branch of their profession, and it was only gradually recognised that the sciences of medicine and chemistry were distinct, although, as in the case of toxicology, they may be closely related to one another.

A description was given in the last chapter of the way in which the theory of spontaneous combustion of the human body, which was at one time commonly regarded as a possibility even among scientific men, was disproved mainly by chemical evidence. There is, however, abundant proof that spontaneous combustion, apart from the human body, can and does not infrequently occur.

The spontaneous combustion of such materials as the contents of a ship's cargo, of hay ricks, of coal dust and coal heaps, of the flour dust in mills, and of used oily cotton waste, is a well-known fact, and has frequently been proved in the law courts, both theoretically and practically, by experiment.

In all these cases the fundamental principle is the same. If we take, for example, the case of a haystack in which the hay is packed away in a damp condition, fermentation of the grass takes place, and this gradually raises the temperature; then at a later stage oxygen is taken up from the air, and eventually the temperature is raised to such an extent that the rick takes fire.

The spontaneous combustion of the fine dust in flour mills, coal mines, dyeworks, and so on, has a similar explanation. Oxidation of the finely divided particles takes place so rapidly that the temperature rushes up beyond the ignition point, and the cloud of dust bursts into flames. Similarly, in the case of oily waste cotton which has been used for cleaning machinery, there is a rapid absorption of oxygen by the oil with which the loose mass is impregnated, and this produces sufficient heat to cause the mass to take fire.

These facts are now so definitely established that the possibility of spontaneous combustion has to be taken into consideration in all cases where a fire has mysteriously occurred. At one time, however, there was general scepticism on the point, and even Liebig did not accept this phenomenon as a fact, for in his *Letters on Chemistry* (1851) he wrote: "When a fire occurs in a room or in a house, the proprietor and the insurance companies have the greatest interest in ascertaining how it arose and who caused it. In most cases this is not ascertained, because he who purposely sets fire to a house does not confess to doing so; neither does he who does it from carelessness.

But when the cause remains unknown no one believes that it has broken out spontaneously and without the aid of some person."

At the same time, since the conditions under which spontaneous combustion can ordinarily take place have been determined by experiment, it is possible in many cases to exclude such a possibility from the factors to be taken into account, and to conclude that the fire must have originated from the application of fire.

A less common cause of spontaneous combustion is that due to the action of chemical substances upon one another. Lucas, in his *Legal Chemistry*, records an instance of the kind, where a fire was proved to have been caused by the action of nitric acid upon turpentine, bottles of the two liquids have been packed together in wood shavings, and apparently broken in transit.

A still more interesting case of the kind arose in connection with the earthquake in January, 1907, in Jamaica. Shortly after the earthquake, which took place between three and four o'clock in the afternoon, numerous fires broke out in different parts of the town, some of which united to form a conflagration. One of these fires originated in the house of a coloured doctor, Dr. Ayrton, in a street in Kingston, and this particular fire was regarded as of first importance by the Insurance Company in determining whether the fire originated before the earthquake or was a result of the earthquake.

Dr. Ayrton stated that he had in his surgery various chemicals of a more or less inflammable character, and the points at issue were whether it was possible that the fire could have been caused by vapours set free by the breakage of bottles coming into contact with a lighted cigarette or a small gas jet used for sterilising purposes, or whether the chemicals themselves had caused the combustion.

In the action brought against the Insurance Company in the High Court, chemical evidence was brought to show that in all probability most, if not all, of the fires were caused by the earthquake, and that there could be little doubt that this was the case with the fire which broke out in the dispensary.

Experiments were described to show that contact of many of the chemical substances known to have been present could have produced a fire within fifteen seconds, and that, if any alcohol or ether were among them, the flames would immediately have spread over the floor and to everything that was combustible.

For example, when calico is moistened with nitric acid and a few crystals of potassium chlorate are added, flame results within a second after the addition of a drop of alcohol. In like manner, when powdered potassium permanganate comes into contact with glycerin, even when diluted with an equal bulk of water, the mixture takes fire within a few seconds.

It was also shown how the glowing end of a cigarette might have contributed to the outburst of the fire, since contact of a trace of potassium chlorate with a glowing cigarette tip will cause any ether vapour to take fire within a second, and alcohol vapour will also catch fire, although more slowly and with less certainty than ether vapour under these conditions.

As the result of this evidence, the Court found in favour of the defendants, the Insurance Company, and held that the fire was caused by the earthquake.

The identification of blood is another question which is now decided by chemical methods, although the tests are usually applied by medical men trained in biochemistry.

In early trials unskilled witnesses were frequently called to prove that stains consisted of blood. For example, Thompson, Pain and Farwell were charged in 1682 with libelling Miles Praunce, who had been a witness at the trial of Robert Green for the murder of Sir Edmund Godfrey, in 1679. The libel consisted in charging Praunce, Titus Oates and others with having given false evidence, since Sir Edmund Godfrey, it was alleged, had not been strangled, but had committed suicide.

The defence was that since blood was found, a sword wound in the body, and not strangling, was the cause of death. One of the witnesses for the prosecution, William Batson, stated in his evidence: "They showed me in a ditch where they said he lay some blood. I cannot say it was his blood; and going a little farther I saw some more whitish blood, and this is all I can swear."

In reply to a question from the Bench as to whether the weather was frosty at the time, the witness replied: "My lord, I cannot tell whether it was, but I will assure you the blood looked to me more like blood that was laid there than anything else."

Evidence such as this was accepted as conclusive, and the prisoners were convicted and sentenced to pay fines and stand in the pillory.

In a more recent case, tried in Paris in 1838, a man was charged with murder, and as evidence of the crime the prosecution produced his knife, which was covered with stains, which were alleged to be blood. The prisoner asserted that these stains were caused by the juice of a lemon which he had cut with the knife, and a chemical examination of the blade supported this contention.

Several instances of similar mistaken inferences are given in the earlier editions of Taylor's *Forensic Medicine*. In one case, for example, a man was suspected of a murder from the fact that he had red stains upon his shirt and collar, but it was subsequently proved that these had been caused by rain extracting the colour from a red handkerchief which he had had round his neck.

It is interesting to follow the evolution of the scientific methods of examining blood stains from assertions such as those just mentioned to the modern biochemical tests which enable a conclusion to be formed as to whether or no a given stain was produced by the blood of a particular species of animal.

The earliest attempts to differentiate between the blood of different animals was based upon the facts that the shapes and numbers of the red corpuscles show great variations in the case of different species. There are also pronounced differences in the forms of the crystals of oxyhæmoglobin which can be separated from the blood of man or that of various animals.

These tests may enable a conclusion to be formed with some degree of probability in the case of fresh blood, but are seldom of use in the examination of dried stains of blood. Although it is frequently possible to separate crystals of hæmin from a stain, and thus to be able to assert that blood of some kind was present, it is rarely possible to speak more definitely on the point.

In 1857 scientific evidence of the difference in the characteristics of different kinds of blood was given at the trial of Nation at the Taunton Assizes on a charge of murder. A knife covered with stains was found on the prisoner at the time of his arrest, but he attributed these to his having used the knife for cutting beef. Scientific evidence was given to show that coagulation of the blood must have taken place upon the knife blade—that is to say, the knife must have been in contact with living blood. Moreover, the relative sizes of the corpuscles in the blood upon the knife indicated that the blood could not have come from an ox, sheep or pig, since they were too small; whilst, on the other hand, they agreed in size with the corpuscles of human blood.

The judge (Lord Chief Justice Cockburn), in summing up to the jury, expressed considerable doubt as to the trustworthiness of this evidence. "The witness," he remarked, "had said that the blood upon the knife could not be the blood of an animal, as stated by the prisoner, and took upon himself to say that it could not be the blood of a dead animal; that it was living blood, and that it was human blood; and he had shown them the marvellous powers of the modern microscope. At the same time, admitting the great advantages of science, they were coming to great niceties indeed when they speculated upon things almost beyond perception, and he would advise the jury not to convict on this scientific speculation alone."

The other evidence was sufficient to prove the guilt of the prisoner without the aid of those facts which the judge so calmly dismissed as "speculations." At the present day any such novel assertion of scientific discovery would be immediately subjected to tests, and either confirmed or disproved. This is a further illustration in favour of the suggestion in the first chapter of the advantage of having a scientific adviser to assist a judge upon scientific questions.

Although a certain amount of differentiation was possible by methods such as these in the case of fresh blood, there was, until about twenty years ago, no means of proving that a stain was derived from the blood of any particular animal. At the present time, however, methods based on the biochemical discoveries of Bordet in 1898 and of Wassermann in 1900, are constantly applied to the solution of this problem and it has been found possible on many occasions to corroborate or disprove the statement of a witness as to the origin of a blood-stain.

Without going into technicalities, it may be explained that the modern methods are based upon the fact that when blood, serum or other fluid from the body of a man or an animal is injected into another animal, such as a rabbit, and this animal killed after the lapse of some weeks, the serum from its blood will give a precipitate with the blood serum of man or of an animal of the same species to which the rabbit was immunised, but not with the sera of other animals.

It has been proved that the reaction for human blood is given by extracts of stains on linen after a lapse of two months, but not in the case of stains several years old, or with those which have been heated.

The test requires many precautions, such as having the serum solution very dilute, and is not so absolutely specific as was at first believed, since the blood of allied species of animals, such as the dog and wolf, react in a similar way. This exception also applies to the blood serum of anthropoid apes, which gives a reaction with serum which has been rendered specific for human blood and *vice-versa*.

But even in such cases it has been found possible to differentiate between the respective sera with some degree of probability, for a serum rendered specific, for example, for human blood, gives a much more pronounced precipitate with the blood serum of man than with that of an ape.

The first occasion on which this biochemical method was used was at a trial for murder in 1902 in France. The prisoner asserted that certain blood stains had been caused by the blood of a rabbit which he had been carrying. An extract of the stains was therefore tested with a serum rendered specific for the serum of rabbit's blood, but gave no indication of a precipitate, whilst, on the other hand, it reacted immediately with a serum which had been made specific for human blood.

It was not until 1910 that evidence based upon the results of this test was given in any important criminal case in this country. At the trial of Mark Wilde, already mentioned, certain stains were noticed on the prisoner's coat, and from the results obtained by the methods described, Dr. now Sir, William Willcox, was able to state that these stains consisted of mammalian blood, and that they gave a precipitate with serum which had been made specific for human blood. Since then the method has been repeatedly used for the examination of incriminating blood-stains.

The most complete transference of evidence from the region of medicine to that of chemistry is that seen in the evolution of the methods of examining food and drugs. In the eighteenth century, when gross adulteration of foods appears to have been the rule rather than the exception, there were many warnings issued by medical men under titles which of themselves must have arrested the attention of the public. For example, in 1757, *My Friend, a Physician* (Dr. Wilkinson) published a treatise on the adulteration of bread, under the title of "Poison Detected: or Frightful Truths and Alarming to the British Metropolis"; and in the following year Dr. Peter Markham exposed the adulteration of bread in a pamphlet with the curious title: "Syhoroc: or Considerations on the Ten Ingredients used in the Adulteration of Bread, Flour and Bread."

The ingredients mentioned included beans, chalk, whiting, slaked lime, alum, bone ashes and soap, together with "certain ingredients not to be divulged, and their evil effects upon human health and sudden death." Not to lose any of the effect of gruesome detail, *My Friend, a Physician* remarks: "The charnel houses of the dead are raked to add filthiness to the food of the living."

A still more celebrated book was that written by Friedrich Accum in 1820, *A Treatise on Adulterations of Food and Culinary Poison*, which owes much of its fame to the following passages in its preface: "The eager and unsatiable thirst for gain is proof against prohibitions and penalties; and the possible sacrifice of a fellow creature's life is a secondary consideration among unprincipled dealers. The designs of the Treatise will be fully answered if it should tend to impress on the mind of the public the magnitude of an evil which in many cases prevails to an extent so alarming that we may exclaim with the Sons of the Prophet: 'There is Death in the Pot'."

As a result of this preface this book has long been known as Accum's "Death in the Pot." It gives a summary of numerous convictions for the use of gypsum, chalk, pipeclay and alum in bread, and of actions taken by the revenue authorities for the sale of sloe, ash and elder leaves as substitutes for tea leaves.

It also refers to cheese rendered poisonous by being coloured with annatto adulterated with red lead, and asserts that cream was commonly adulterated with rice powder or arrowroot, preferably the latter.

In 1831 *The Lancet* published an article on "Poisonous Confectionery," by Dr. O. Shaughnessy, and this was followed in 1836 by another article, but it was not until 1850 that any systematic attempt was made to expose the widespread evils of adulteration. In that year a "Commission," which was really Dr. A. H. Hassall, began a campaign in which he used the microscope as his weapon, purchasing samples and publishing the results of his examination in *The Lancet*. These series of articles were continued for several years, and ultimately led, in 1860, to the passing of the first Food and Drugs Act.

A few Public Analysts, almost all medical men, were appointed under this Act, but as the appointments were only permissive most authorities did not trouble to make them, and the Act speedily became a dead letter. This drawback was remedied in the Act of 1870, which made the appointment of Public Analyst compulsory upon municipal authorities. As a result of this, the office of Public Analyst was in many cases united with that of Medical Officer of Health, and many of the early Public Analysts were accordingly not competent chemists. The scientific development of adulteration, however, soon led to an improvement in the chemical qualifications of the Public Analyst, and the appointments are now only given to men who satisfy the requirements of an independent Government department as to their knowledge of the chemistry of food and drugs.

With all their shortcomings, it is unquestionable that the Food and Drugs Acts have been the direct cause of an enormous improvement in the general quality of the food in this country. One has only to compare the conditions of things as revealed in Accum's "Death in the Pot" with those shown in the reports of various Public Analysts to realise what a change was effected by that legislation.

The old gross forms of adulteration have to a large extent passed away, and have been replaced by more skilful methods, in which the pocket rather than the health of the consumer is affected.

Curiously enough, however, the effect of the war in restoring primitive conditions extended even to the adulteration of food. For example, the Public Analyst for Paddington stated in a report three years ago that, after searching for more than forty years for the legendary sand in sugar, he had at last found it to the extent of 6½ and 9 per cent. in two samples of brown sugar. Hence it would seem that the pious grocer who called his assistant to prayer after watering the treacle and sanding the sugar might not have been libelled after all.

The fraud of adding starch products to milk, to which Accum alludes, had its modern counterpart two years ago when a milkman was convicted at Highgate as "one of a rascally gang" engaged in selling a mixture of starch and water as "lovely milk." These crude methods, however, were only temporary revivals, and the stream of adulteration has again resumed its well-regulated course.

The task which the early Public Analyst had to face was relatively simple, and he was not confronted with the problems which he has to solve to-day. For the aim of the scientific adulterator is never to allow his product to fall below the border line between suspicion and certainty. And so it frequently happens that, although a Public Analyst may feel quite certain that a sample is not genuine, he cannot condemn it as adulterated without running considerable risk of losing his case.

This is owing to the fact that many natural products vary within such wide limits that it is possible for an adulterated sample to show better results on analysis than a genuine sample of poor quality. For example, butter made from the milk of Dutch cows, which have been left too long in the field, may be, and, in fact, has been, in the past condemned as adulterated, whereas a good type of butter chosen for the purpose may be adulterated with a considerable amount of foreign fat, and yet be passed as genuine.

In such cases an official standard which shall raise a presumption that a sample is not genuine would be preferable to the present uncertainty, although such standards have the drawback that, while repressing flagrant adulteration, they tend to give security to petty adulteration.

The proportion of water permissible in butter has now been statutorily fixed at 16 per cent., and there are numerous other food products to which analogous standards might be applied without risk of injustice, such as, for example, the percentage of carbonate in baking powder, of mineral matter in rice, and so on.

Again, we have such a presumptive standard in the case of milk, which, according to the Board of Trade Rules (1901), must contain not less than 3 per cent. of fat, and 8·5 per cent. of other solids; or otherwise must be presumed to be not genuine until the contrary is proved.

On numerous occasions during the past few years there have been "appeals to the cow" to prove the genuine character of milk condemned as not genuine, since it did not reach these standards.

At one time, in accordance with the case of *Smithies* v. *Bridge* (1902), it was accepted that where a purchaser asked for new milk, but received a liquid which was abnormal in composition owing to the improper feeding of the cow, and thus had been "adulterated at the other end of the cow," an offence had been committed under the Act. But in 1916 an absolutely opposite decision was given in the case of *Hunt* v. *Richardson*, in which it was decided that milk is genuine if sold as it comes from the cow. This decision has undoubtedly led to a lowering in the quality of the milk, and seems illogical, since it would enable any watery fluid produced from the udder of a cow to pose as milk.

In cases such as these the Public Analyst has statutory directions behind him, but when we come to articles as to the composition and characteristics of which there is a conflict of opinion among scientific authorities, an independent opinion has to be formed, and the Public Analyst who attempts to set up an isolated standard may run the risk of involving his authority in needless expense.

For example, in 1920 a prosecution was instituted for the sale of corn flour which contained flour derived from a cereal other than maize. Several leading chemists appeared for the defence, which was conducted by Treasury counsel, and the case was ultimately dismissed with costs against the Borough Council.

It has been decided in a High Court case that where there is no statutory standard for the genuineness of an article, the Court must fix a standard based upon the evidence before it.

It is, therefore, frequently an open question whether or no an article will be regarded as adulterated when brought before a bench of magistrates. For example, there is no legal standard as to the strength of acidity in vinegar, and in two cases, tried a few years ago, the magistrates dismissed the summons upon this ground. On appeal, however, it was held that as the analyst's certificate stated that genuine vinegar should contain 4 per cent. of acetic acid, and as no evidence to the contrary was given, the magistrates ought to have convicted.

These cases were quoted in a similar case heard at Reigate in 1919, but, since evidence was brought by the defence to prove that a 3 per cent. standard for vinegar had long been recognised by Public Analysts as a commercial standard, the magistrate dismissed the case, and there was no appeal.

The question of preservatives in foods has been even a more fruitful source of dispute than the definition of food products, and the mass of conflicting decisions has had the result of making the working of the Food and Drugs Acts as affecting certain products largely a game of chance. On certain points there is a general consensus of opinion. Everyone is agreed, for instance, that milk should be sold without any preservative whatever, and the same remark applies to numerous other food products. But it is when we come to substances which the public, rightly or wrongly, expects to keep for several days or indefinitely, that we meet with the greatest conflict of views among medical men and public analysts, and a divergence of practice among different authorities.

For example, in 1918 the Local Government Board recommended that a certain proportion of boric acid should be permitted in cream. Certain authorities accepted this advice; others did not, and instituted prosecutions for the sale of cream containing an amount of preservative permitted by other authorities.

In the case of one borough this institution of a local standard created such a sense of injustice among the traders of the districts that the local Chamber of Commerce passed a resolution pressing for the establishment of a legal standard for preservatives in cream, and advocating the abolition of "arbitrary and conflicting local standards."

This preservative question is undoubtedly another that should only be decided by a central authority, which should have the power to hear the evidence of medical men, public analysts, and representatives of the commercial interests involved, and to fix standards which should have statutory effect, and be rigidly enforced by all local authorities.

CHAPTER VI

SCIENTIFIC EVIDENCE IN POISON TRIALS

REFERENCE has already been made to the evolution of the evidence in cases of poisoning from vague suspicions of witchcraft into definite medical and chemical proof, until at the present day the two branches of scientific evidence, although quite distinct, have become mutually corroborative and usually essential.

In the trial of Richard Weston, in 1615, for the murder of Sir Thomas Overbury, the Lord Chief Justice (Coke) directed the attention of the jury to the miraculous power of poison, which he attributed to diabolic agency. "The devil," he said, "had taught divers to be cunning in poisoning so that they can poison in what distance of space they please by consuming the *calidum* or *humidum radicale* in one month, two or three or more as they list, which they four manners of ways do execute (1) *gustu*; (2) *haustu*; (3) *odore*; (4) *contactu*."

Anne Turner, as already mentioned, was also tried for the murder of Sir Thomas Overbury, and the way in which sorcery was associated with the evidence of the purchase and administration of alleged poisons had probably much to do with her conviction.

It is not until we come to the trial of Mary Blandy in 1752 that we meet with any record of satisfactory evidence in poison trials. In that case the prisoner was accused of having poisoned her father by giving him a white powder sent to her by her lover, Captain

Cranstoun, who had concealed from her the fact that he already had a wife. The motive alleged for the crime was that Mr. Blandy had refused to let his daughter have anything to do with Cranstoun, who, on his part, wished to get control of £10,000, of which the victim had boasted possession.

It was not in dispute that Mr. Blandy had received two doses of the white powder in his gruel, or that his daughter had given it to him, and there was evidence that for some time previously she had referred to mysterious music in the house, which was supposed to portend a death.

The doctor who had attended the victim gave evidence that the deceased had died with all the symptoms and post-mortem appearances of arsenical poisoning, and that the white powder in the gruel consisted of arsenic. Taking into consideration the primitive state of chemical knowledge at that period, the evidence given by Dr. Addison in this case appears conclusive. The physical and chemical characteristics of the white powder were shown to agree in all respects with those of white arsenic, and the witness concluded his cross-examination with the answer: "I never saw any two things in nature more alike than the decoction made with the powder found in Mr. Blandy's gruel and that made with white arsenic."

The circumstantial evidence in the case was so convincing that the prisoner was convicted by the jury after only a few minutes' deliberation.

The scientific evidence given in the Blandy trial contrasts very favourably with that given at the trial of Katharine Nairn and Patrick Ogilvie in 1765, on the charge of murdering the husband of the female prisoner and the brother of Patrick Ogilvie. Although there was evidence of motive, no conclusive evidence that the deceased had died of arsenical poisoning was given, despite the fact that it was proved that Lieutenant Ogilvie had bought powdered arsenic to kill dogs.

Expert evidence was called for the defence to prove that the deceased could not have been poisoned by arsenic introduced into his tea, because "he (the witness) had made experiments and knew well that it would not dissolve in hot water," which statement, by the way, is not correct.

Medical evidence was also given that the symptoms described might have been due to natural causes, but, in spite of the want of conclusive evidence as to poisoning, the prisoners were both found guilty.

There has frequently been a conflict of opinion on the question of what constitutes a poison. For example, in 1836 two men were tried at Norwich on the charge of attempting to murder another man by means of "a deadly poison," blue vitriol, which they had introduced into a glass of milk.

Evidence was given by a medical man that blue vitriol was a deadly poison, whereas a witness for the defence stated that he did not consider it a poison, nor was it scheduled as such. In view of this divergence of scientific opinion the prisoners were acquitted, but as it is now recognised that blue vitriol or copper sulphate is poisonous, it is probable that under similar circumstances a different verdict would be given to-day.

Cases of this kind illustrate the difficulty of finding a satisfactory definition for a "poison," since substances which are harmless in small quantities can destroy life if introduced into the system in large amounts. Common salt, for example, would hardly be classified as a poison, and yet there are several cases on record where death has resulted from taking a large dose of salt. Even the definition of a poison as "a substance which, when taken internally, is capable of destroying life without acting mechanically on the system," is far too wide, since it could be applied to many substances, including cold water, which, under certain conditions, can produce gastritis and death.

Taylor therefore drew the following distinction between poisonous and non-poisonous substances: "If the injurious effect does not depend upon the nature of the substance taken, but upon the state of the system at the time, the substance cannot be regarded as a poison."

In giving evidence in respect of attempts to poison, a toxicologist has not to express any opinion on the intention of the prisoner, but only to state whether the means employed were such as would be likely to endanger life.

An amusing commentary on the difficulty of reconciling the legal and scientific definitions is afforded by a case brought before a County Quarter Sessions in 1896. A man procured some prussic acid from a local druggist, and informed his wife that he intended to kill himself. She succeeded in hiding the bottle, and told the druggist not to supply her husband with any more poison. She also informed the police, who consequently kept a close watch on this man. Accordingly on his next visit to the druggist he was supplied with a bottle which was labelled "poison," but contained nothing but water.

The accused was then seen by a policeman to go from the shop to a yard, where he drank the contents of the bottle. He was at once arrested, and duly charged with attempted suicide "by means of a certain noxious drug—to wit, water."

The "noxious drug" which has met with most favour as a poison has been arsenic. This may be attributed partly to the fact that in one form or another it has been obtainable without difficulty, and partly to the power of suggestion induced by familiarity with the name. A long list of crimes in which arsenic was used might be drawn up, but few of these would have any points of especial scientific interest beyond the fact that the preservative action of arsenic has sometimes kept the body from decomposition for years, and that it has thus been possible to prove after months or years that death was due to that poison.

The case of Smethurst, who was tried in 1859 for the murder of Isabella Banks, is notable from the fact that the prisoner, who was a medical man, laid a successful trap for Dr. Taylor, the Official Analyst to the Home Office. Arsenic had been found in the body, and there was little doubt from the general evidence that it had been administered by Smethurst. The test then employed was one in which the arsenic is caused to deposit upon a strip of bright copper, and is only conclusive when the copper itself has been proved to be free from arsenic. Among the bottles examined by Dr. Taylor was one containing a solution of potassium chlorate, and this liquid, when subjected to the test, dissolved some of the copper, although subsequently an arsenic deposit was obtained, and evidence was given at the Police Court proceedings that the contents of this bottle contained arsenic. The prisoner expressed great anxiety that the remainder of this liquid should be kept, and when it was subsequently examined by means of another test, it was discovered that the arsenic separated had been derived, not from the potassium chlorate solution, but from the copper which it had dissolved. The prisoner was aware that this test for arsenic was untrustworthy when chlorates were present, and as he had access to his room after the death was able to leave the bottle of solution of potassium chlorate among the other bottles of innocent medicines.

Dr. Taylor himself discovered the mistake, and gave a frank explanation at the trial, but the doubt thus raised was sufficient to discredit his other evidence; and, although the prisoner was convicted, he was subsequently set at liberty after the scientific evidence had been reviewed by Sir Benjamin Brodie at the request of the Home Secretary.

At the present day such a mistake as this would hardly be possible, and it is not the analytical methods for the detection of arsenic which are challenged, but the interpretation of the results.

The chief test now used is known as Marsh's test, and depends upon the conversion of the arsenic into a gaseous compound with hydrogen, which is then decomposed by heat as it passes through a narrow tube, and leaves a metallic mirror of arsenic. By comparing this mirror with standard mirrors obtained under the same conditions with known quantities of arsenic, it is possible to form an estimate in parts per million of the arsenic in the substance under examination. Then by a calculation the amount present in the whole of the organ is found, and by similar calculations the amount in the whole body.

This quantitative application of the test was first used in the trial of the Seddons in 1911, and more recently in other cases, in some of which the defence successfully put forward various theories to account for the arsenic found, and urged that the total amount discovered was not sufficient to prove that death was due to arsenical poisoning.

Antimony closely resembles arsenic in many respects, and is detected and estimated by analogous tests. It has also a similar preservative action upon the body, and this property enabled proof to be brought that some of the earlier victims of the poisoner Chapman had died of antimony poisoning.

It was one of the poisons used in 1856 by the notorious Palmer, who adopted the precaution of mixing his noxious drugs, so that there should be a conflict of evidence. Palmer, who was a medical man, was heavily in debt, and as his victim, Cook, had just won a large amount at the Shrewsbury races, he hoped to secure this for himself. Cook died with all the symptoms of strychnine poisoning, but the local doctor was induced by Palmer to sign a certificate giving apoplexy as the cause of death.

Certain circumstances led to an inquest being held, and, although Palmer was suspected, he was allowed to be present, and attempted to dispose of the stomach of the victim after it had been sealed up in a jar.

The medical evidence called by the Crown left little doubt as to the cause of death being strychnine, but Taylor, the Home Office analyst, failed to detect strychnine, although he found antimony. This led to an unparalleled controversy in the public press, Taylor being accused of incompetence, while the trial was still in progress; and, as mentioned in Chapter I, medical and chemical evidence was subsequently called for the defence to prove that if strychnine had been present it could have been detected, and that the medical symptoms described were capable of another explanation than poisoning.

In the course of his summing up the judge (Lord Campbell) expressed a very strong opinion on the conduct of the scientific witnesses for the defence (see p. 4), and, referring to the fact that strychnine had not been found, he remarked that "there was no rule of law according to which the poison must be found in the body of the deceased, and all they knew respecting the poison not being found in the body was that in that part of the body that was analysed by the witnesses no strychnine had been found."

Shortly after the trial Taylor published a brochure, in which he defended his evidence, and called attention to the fact that there were several previously recorded cases in which there was little doubt that strychnine had been used, although none had been found in the body. His real defence is embodied in the remark: "Chemical tests and processes have not undergone that ordeal with regard to strychnine which they have in the case of arsenic."

At the present day, when our knowledge of alkaloids is far more advanced than it was seventy years ago, something more conclusive than medical evidence of symptoms would be required in the case of an alkaloid which has now been so thoroughly studied as strychnine, although there are still many vegetable poisons which are but little known, and the chemical tests for which are as yet uncertain. Such poisons have either been used fortuitously by ignorant peasants knowing only that a particular plant was poisonous, or by skilled medical men who have used the active principle from the plant in the expectation that it could escape chemical identification.

In the year 1841 a woman named McConkey was tried at the Monaghan Assizes on a charge of murdering her husband. No trace of poison could be detected, but the symptoms and post-mortem appearances were identical with those produced by poisoning with monkshood or aconite. The prisoner was convicted, and prior to her execution confessed that she had mixed "blue rocket" root (*Aconitum napellus*) with pepper and sprinkled it over the cabbage for her husband's dinner.

Dr. Lamson took advantage of the lack of chemical tests for aconitine, the active principle of aconite, when he made use of it as the means of disposing of his young brother-in-law, who was a cripple at a school at Wimbledon.

Lord Brampton, who, as Sir Henry Hawkins, tried the case, has pointed out that Lamson was far too clever a man to put aconitine in the pills which he gave his victim, and that in all probability he had concealed the alkaloid in the raisin of a cake, a slice of which he gave to his young brother-in-law, while he and the schoolmaster had eaten portions of the otherwise harmless cake.

The boy died the same evening, and examination of the stomach showed that a vegetable irritant poison was the cause of death. Investigations showed that Lamson had brought small quantities of aconitine on several occasions, and the presence of aconitine in the body was subsequently proved firstly by its general chemical reactions as an alkaloid, and secondly, by experiments upon mice which were killed with the same symptoms as those produced by a standard solution of pure aconitine.

Counsel for the prisoner, Montagu Williams, made a strong point of the absence of any conclusive chemical evidence of the presence of aconitine. He pointed out that the scientific witnesses for the Crown admitted that they had only the results of these physiological tests upon mice to rely on; and that it was well known that mice were readily killed even by an injection of pure water. Hence it was dangerous to contend that because the injection of a substance extracted from the body killed mice, that substance must be aconitine. Apart from that, substances of the nature of alkaloids were formed in the body by decomposition, and the effects attributed to aconitine might really have been due to one of these alkaloidal substances.

Notwithstanding the eloquence of his counsel, the prisoner was found guilty, and Montagu Williams, in his book of reminiscences, admitted that the verdict was a just one, and that from what had subsequently transpired the boy had not been the first victim of Lamson.

The methods used in the Lamson case recall those employed in an early French case recorded by the expert Foderé, in which the results of a test applied to an animal afforded presumptive evidence of the presence of a vegetable poison. A child had died with symptoms of narcotic poisoning after taking some broth, and there was some reason for suspecting that henbane had been used. A piece of the meat from which the broth had been made was therefore given to a cat, which died with similar symptoms after about five hours. From the post-mortem appearances the conclusion was drawn that it was probable that the poison present was *hyoscyamus* or henbane.

It is also interesting to note that this case appears to be the only one, prior to the notorious Crippen case, in which henbane was the source of the poison.

The properties of hyoscine and hyoscyamine, the active principles of henbane, were then but little known, and Crippen probably took this fact into consideration in choosing them for his evil purpose. But in this instance it was not necessary to rely upon physiological tests upon animals to supplement the medical evidence, for an alkaloid was isolated which could be recognised by chemical tests as hyoscyamine, and it was also proved that the prisoner was in possession of a quantity of this somewhat unusual alkaloid.

CHAPTER VII

BACTERIOLOGICAL EVIDENCE

MOST chemists of to-day have a practical acquaintance with one or more branches of bacteriology, but the science has now become so complex and extensive in its scope that a full knowledge of the subject can only be acquired by specialisation. And even those who are fully acquainted with one class of bacteria may frequently have little, if any, knowledge of the life history and applications of other species. For instance, most medical men have had some training in bacteriology, and are acquainted with the characteristics of the more common micro-organisms of disease, but they will not usually have had the opportunity of studying those organisms which are used in industrial processes, such as tanning, vinegar making, and the ripening of cheese.

An amusing instance of the effect of such want of knowledge on the part of a medical man came within the writer's experience in connection with a claim which was brought against a firm of vinegar brewers.

It should first be explained that vinegar is made by a process of treating alcoholic liquids, such as fermented malt extract, wine, beer, or sugar solutions, with special species of acetic bacteria, which are able to convert the spirit into acetic acid, to which vinegar owes its sourness.

Various species of bacteria are used for this purpose, and under the microscope they usually appear as small chains of round cells (Fig. 24) or long filaments (see Figs. 25 and 26). A regulated supply of air is essential to this oxidation of the alcohol into acid, and when there is an insufficient supply of air or a want of nutriment, the vinegar bacteria form themselves into a slimy, leather-like mass, popularly known as "mother of vinegar," but termed *zooglôea* by bacteriologists. Even after the vinegar has been filtered and bottled, it will still contain spores of the acetic bacteria to which it owed its origin, although these die after some time if air is excluded. If, however, the stopper of the bottle is slightly

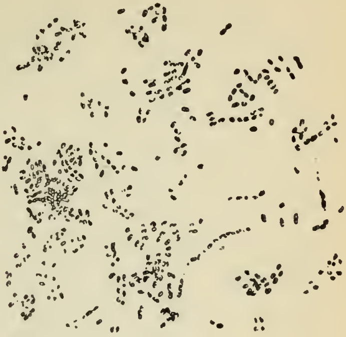
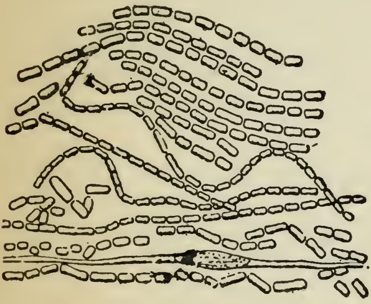


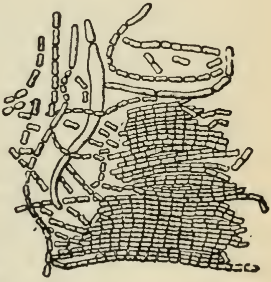
Fig. 24.

Pasteur's Drawing of Vinegar Bacteria.



Bacterium Pastorianum (*Hansen*).

Fig. 25.



Bacterium aceti (*Hansen*).

Fig. 26.

loose, so that a minute but constant supply of air can penetrate into the bottle, the vinegar bacteria will form a jelly-like mass which will take the form of the neck of the bottle and somewhat resemble a long cartridge in size and shape. This is not at all an uncommon occurrence, though it frequently escapes notice owing to the bottle being wrapped in paper. It may even happen that a succession of these "wads" will form, each dropping down in turn, into the vinegar, with the result that the contents of the bottle will have the appearance shown in Fig. 26, Plate VIII.

In this particular instance two working women shared a whole half-pint bottle of vinegar between them as an accompaniment to ham. Then, feeling uncomfortable after such a vinegar orgie, they took a whole box of liver pills, with the result that they had pains in the back, for which they took a box of back-ache pills, and finally they called in a doctor, who promptly gave them more medicine. He then examined the empty vinegar bottle, and, noticing the curious bacterial formation described above, pronounced that it was a parasite, and was the cause of his patients' illness.

On the strength of this the two women claimed damages from the makers of the vinegar, who naturally, under the circumstances, refused to admit any liability. Before the case was brought into court a letter was written to the doctor explaining the nature of the growth, and pointing out that it was hardly necessary to explain to a bacteriologist that it was the zooglôeal condition of *Bacterium xylinum*. No answer was received; but from that time the claim for damages

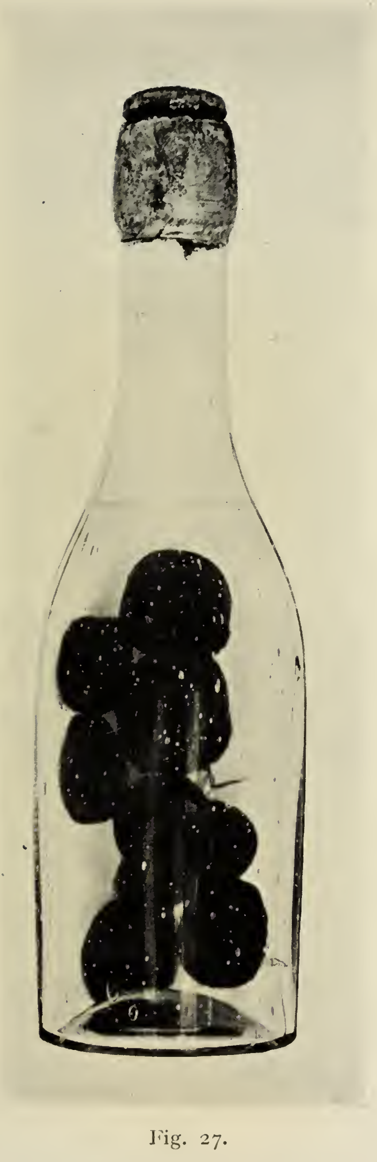


Fig. 27.

Plate VIII. Bottle of Vinegar, showing "Wads" of Mother-of-Vinegar (Zoogloeal Condition of Acetic Bacteria.)

[*From a photograph by Mr. T. J. Ward*

To face page 102.]

was abandoned, and the doctor lost his opportunity of demonstrating his "parasite" in court.

A case of this kind emphasises the advisability of having elementary instruction given in all schools on the nature of simple bacteriological facts connected with everyday life. Some common phenomena are still as great mysteries to well-educated people as they were centuries before their cause was known. An example of this is to be found in the phosphorescence sometimes shown by the flesh of certain animals and frequently by that of marine fishes. This is now known to be produced by several species of bacteria, but at one time it was regarded as a miraculous occurrence, especially when, as sometimes happened, the whole of the meat became infected in this way.

In 1676 a Dr. Beale, of Yeovil, in Staffordshire, published in the *Philosophical Transactions* of the Royal Society, an account of a curious instance of the kind, and mentioned as a possible explanation that the stars were exceedingly bright that night, and the weather warm and still. A woman of that town had bought a neck of veal which seemed perfectly good in every respect. On the following evening, about nine o'clock, the neck of veal "shined so brightly that it did put the woman into great affrightment." She roused her husband, and he, seeing where the light came from, endeavoured to extinguish it by beating the veal, and finally plunging it below water; but in vain. At last he found that he was able to extinguish the light by wiping the meat with a cloth. The next day the joint was cooked, and certain neighbours who had seen it giving light were asked to dinner. All thought it as good as any they had eaten.

It was fortunate, perhaps, for this particular family, that they lived at a period when investigation into the causes of natural phenomena had begun to take the place of superstition. A century or so earlier they would probably have been tried as witches.

This was the fate of more than one poor woman in whose possession bread had developed scarlet patches, so that it became known as "bleeding bread." There are many references in mediæval history to this curious change of colour in bread and wheat, which was regarded as a miracle and a portent. It is now known to be due to the growth of a fairly common microorganism which, in allusion to its history, has been termed *Bacillus prodigiosus.* This organism produces a red colouring matter in its growth, and it can be readily cultivated in many media, in addition to bread.

For many years bacteriology was regarded as being of less value than chemistry for the investigation of such natural products as water and milk, but it is now recognised that the results obtained by the two sciences are mutually helpful, and that in some cases it is possible to base a judgment upon the results of bacteriological examination which could not be formed in any other way.

This was clearly shown, some ten years ago, when bottles of the soda water prepared by the leading mineral water manufacturers were examined at the instance of the Medical Officer of Health for London. Up to that time it had been generally accepted that the process of aerating soda water with carbonic acid gas under high pressure would sterilise the contents of the bottle, and it therefore came as a surprise both to scientific men and to those connected with the industry when it was discovered that a large proportion of the soda water then being sold was decidedly impure. Thus, while many contained only one or two organisms per cubic centimetre and were practically free from *Bacillus coli*, the typical sewage micro-organism, others yielded up to 1000 bacteria per c.c., and the *Bacillus coli* could be isolated from 1 c.c.

As the result of this investigation, a meeting of the mineral water manufacturers was held, at which various recommendations were made by the Medical Officer with the object of insuring the preparation of a purer product, and in the meantime it was arranged that no proceedings should be taken for some time against any firm which undertook to carry out these recommendations, which included periodical tests of the water and systematic methods of cleaning the bottles.

A similar series of tests was made after about six months, and these showed that the precautions which had been taken had effected a great improvement in the purity of the soda water sold in London.

One interesting point brought out in the investigation was that soda water which had been made with distilled water, and had accordingly been advertised as exceptionally pure, gave much worse results than the average made with tap water—a result which was probably due to the bottles having received their preliminary washing with impure water.

While there is everything to be said for any system which will insure the purity of such a widely consumed product as soda water, it is questionable whether an occasional examination of isolated bottles is the best method of attaining this end.

Although aeration with carbon dioxide does not produce sterility, yet experiments made by the writer have shown that the contents of a bottle do eventually become sterile, and so it might readily happen that a bottle coming from a factory where the conditions were bad could be passed as satisfactory.

On the other hand, the method makes no allowance for the accidental contamination of an isolated bottle, which need not necessarily be typical of the products of the factory, and the only fair method would be to make a series of examinations of soda water known to have been recently bottled.

It will thus be seen that it is not an easy matter to fix a definite standard of bacteriological purity, but, after making every allowance for accidental variations, there should be no difficulty in producing soda water which, when examined soon after bottling, does not contain more than 100 micro-organisms per 1 c.c. This limit, which has been suggested elsewhere by the writer,* errs on the side of leniency; but, in view of the fact that many of the manufacturers do not have their own wells, it is a fair one to fix.

Inspection of the factories at irregular intervals, however, would be a more effective means of insuring the purity of soda water than even frequent bacterioscopic examination of isolated bottles.

Quite recently the system of bacteriological control has been applied to the still more important product, milk. Under a special order made by the Ministry of Health in January, 1923, such terms as "Certified Milk," "Grade A Milk," and "Pasteurised Milk" may only be sold under a licence granted by the Ministry. In the case of "certified milk" not more than 30,000 bacteria must be present in 1 c.c. of milk at the time of delivery to the customer, and *Bacillus coli* must not be present in one-tenth of a c.c., whilst "Grade A" milk must not contain *Bacillus coli* in one hundredth of a c.c., or more than 200,000 bacteria per c.c. The bacterial requirements for "Pasteurised" milk are the same as for "certified" milk, and regulations are also fixed as to the temperature and time of heating the milk. In addition to the milk passing these bacteriological tests, each farm is to be inspected and its equipments, methods, and record passed as satisfactory.

---

* Thorpe's *Dictionary of Applied Chemistry*, 1920. Article on *Aerated Waters*.

The scheme is not compulsory, and ordinary milk may still be sold with as many bacteria as it can contain, provided only it does not sport a label claiming exceptional purity. It is, however, a step in the right direction, and the possibility of obtaining a milk which can be accepted as reasonably pure may in time lead to a general demand for all milk to be of equal purity.

The weak spot about the scheme is that the fee which is to be paid for the bacteriological examination is entirely inadequate to cover the cost, and unless this is remedied the work will either have to be inefficient, and therefore untrustworthy, or the bacteriologist will have to accept the gratitude of the milk dealers and their customers as part of his payment.

It will be noticed in the regulations referring to "Pasteurised" milk that no attempt is made to obtain a sterile product, the highest temperature to which the milk is to be heated (viz. 150° F.), being far below the boiling point. In other words, there is only a partial sterilisation and reduction in the number of bacteria present.

A recent Government report on the bacteriology of canned meat and fish shows that these products, too, are at best only partly sterilised. Invariably certain types of living bacteria are left, but, unless air gains access to the tins through minute holes, they are unable to develop in such a way as to cause decomposition of the food. In the past the cause of canned food going bad has been attributed to bacteria from the outside air finding their way into the can through minute leaks due to rust or to faulty tinplate, but a long series of experiments has shown that far more importance is to be attached to the supply of oxygen to bacteria already present in the can, and that the food is sound owing to the absence of oxygen rather than to its being sterile.

At the same time, an efficient sterilisation process, that is to say, one which is capable of destroying those species of bacteria which decompose food products in the absence of air and form deadly toxins, is the only safeguard against food poisoning such as the outbreak at Loch Maree in 1922.

It is probable that from time to time there have been isolated cases of the same kind in this country, but this is the first time that the cause of death has been traced to the specific micro-organism *Bacillus botulinus*, which produces a deadly toxin which, when taken even in a minute quantity, produces the symptoms known as botulism, which almost always ends in death.

Outbreaks of this form of food poisoning are far more common in the United States than here, which is to be attributed to the practice there of eating canned food such as asparagus in a raw condition. So frequent have these outbreaks been that special regulations have been made in California as to the temperature required for effective sterilisation.

In the Loch Maree outbreak eight persons ate part of twelve small sandwiches between them, and not one was alive a week later. The paste from which the sandwiches had been made was submitted to Mr. Bruce White for bacteriological examination, and was found to be infected with *Bacillus botulinus*; and evidence was given by him to this effect in the subsequent enquiry at Dingwall.

It was proved that every reasonable precaution had been taken by the manufacturers of the wild duck paste, but at the same time it was pointed out that sterilisation in a glass jar was not so effective as in a can.

The spores of this particular bacillus, which occurs in the soil in many districts, have been shown to be highly resistant to heat, for they can withstand boiling for five hours. Wherever the bacillus has found its way into the soil in any area, its spores may be present upon the vegetable or fruit grown in that soil, and the sterilisation process should therefore be of such a nature as to insure the destruction of any such spores.

A Government Report on the subject has been published this year, and it is possible that legislation on the methods of sterilisation in factories may result from the enquiry, as has been found necessary in the United States.

CHAPTER VIII

Documentary Evidence

The internal evidence of a document has often been more convincing than the evidence of eye-witnesses, and on many occasions has been the only evidence obtainable. For instance, forged historical autographs have been detected through having been written upon paper having a watermark of a later period than the alleged date of the writing.

An instance of the kind is cited by Wills in his *Circumstantial Evidence*, where a trial is mentioned at which evidence was given that a letter, alleged to have been sent from Venice, had been written upon paper made in England at a later date.

The evidence of the water mark, however, is not always conclusive as to the date of the paper, since manufacturers may intentionally use moulds of a wrong date. Thus in a trial which took place in 1834 in Edinburgh, evidence was given by the paper manufacturers that they were post-dating their paper, and were using moulds with water marks of 1828 pattern to supply a special order. It is only a clumsy forger who will lose sight of the silent testimony of the water mark, and the fabricators of spurious ancient documents have been known to buy old paper of the right quality and having the correct water mark of the paper used at the period to which their forgeries were supposed to belong.

Valuable information may sometimes be gathered from a microscopical examination of the paper of a document, interpreted by a knowledge of the development of the industry. For example, in the old type of paper, made from rags, the linen or cotton fibres show distinctive features plainly recognisable under the microscope, and absolutely different from the modern wood pulp papers. It is obvious that a document dated, say, at the earlier part of last century, could not be genuine if written upon paper the fibres of which showed the characteristic structure of wood cells.

In a case within the writer's experience it was desired to find a clue as to the origin of certain forged banknotes. These were printed on very common paper made of pure linen fibres, and this suggested that they had originated from Russia, formerly the great flax-producing country of the world.

Chemical tests may also be of service in proving the similarity or dissimilarity of two papers. For example, there are pronounced differences in the amounts of mineral matter in papers and in the nature of the constituents of the ash, whilst a very sensitive test has been based upon the varying proportions of sulphur in paper, which can be accurately estimated by means of a colour reaction.

Further valuable information may be gained from an examination of the sizing. It has not infrequently happened that a slight erasure has changed the whole sense of a letter. An instance of the kind came within the writer's experience, where a letter containing the words "our house" was put forward as evidence as to the ownership of the property.

When this document was examined under the microscope it showed unmistakable signs of erasure in front of the word "our," the sizing having been removed and the fibres scratched up, apparently with the point of a knife. The paper was also more transparent at the place where the erasure had taken place.

These facts supported the contention of the other side that the original reading had been "your," and that the "y" had been erased.

To lessen the chance of detection from such a trail, skilful forgers paint the place over with a resinous solution, so that superficially it has the appearance of the rest of the surface of the paper. This dodge may be detected by an examination of the sizing, the patched place being stripped by brushing it over with alcohol or other solvent.

Tests have also been devised for distinguishing between papers sized with material of animal and of vegetable origin, and for recognising the presence of undecomposed alum in the paper. Evidence based on these tests was given in a trial for the forgery of letters of credit, and it was proved that the paper of the genuine documents behaved quite differently.

The ink in which a document is written is frequently a factor of still greater importance than the characteristics of the paper.

The earliest type of ink, composed of lampblack or other form of carbon, mixed with gum or glue, dates back to the days of ancient Egypt. It is still used in Eastern countries to some extent, but in Europe has been superseded for many centuries by iron-gall ink prepared by mixing an extract of galls with iron sulphate, technically known as copperas. The earliest reference to the use of such inks is by the monk Theophilus in an encyclopaedia of Christian art of the eleventh century, and it is probable that by the end of the thirteenth century the modern type of ink had replaced the older kind.

As there are several sensitive tests for iron, whilst carbon may be recognised by the fact that it is not affected by reagents which bleach the iron-gall ink, it is not difficult to distinguish between the two kinds of ink on paper. In this way Sir Humphry Davy was able to show that the writing on the papyri unearthed from the ruins of Herculaneum, which was overwhelmed in A.D. 79, had been done with the old type of carbon ink.

As an instance of the value of these tests for carbon and iron inks in the examination of modern documents, a case may be cited where a clerk had falsified an entire ledger, and, in order to make the earlier entries appear older, had added Indian ink (which has a carbon basis) to a modern blue-black ink. These entries resisted the action of dilute chemical reagents, and the unaltered particles of carbon could be plainly discerned with the aid of the microscope.

The earlier iron-gall inks could not have been easily distinguished from each other on paper excepting that in some cases more iron would have been present. When first applied to the paper fresh iron-gall inks give only greyish markings, and it is not until the air has acted upon the compound that the true blackish pigment of oxidised iron tannate is formed. Hence in the early periods it was usual to leave the ink in open vessels exposed to the air for some time, so that this black pigment should form to some extent in the liquid itself, which would then have a darker tone when applied to the paper.

The use of indigo to give a temporary colouring matter to iron-gall inks pending the formation of the black pigment was first published in 1770, and was adopted in England in 1836. Aniline dyes were first claimed for this purpose in 1861, and various blue dyes were commonly employed in the manufacture of blue-black inks more than forty years ago.

The present writer has been able to trace the presence of a blue pigment in writing in old ledgers for about thirty-six years, whereas the writing prior to that time in the same ledgers was in iron-gall inks which did not show any indication of blue pigment.

The importance of this point has been shown on several occasions in connection with claims for old-age pensions, for it is obvious, from what has been said, that the presence of an aniline dye in an ink upon a document supposed to be seventy years old would be incompatible with its being genuine, and this fact alone has proved conclusively that the entries in family Bibles, produced as evidence of age, must have been forgeries.

In the case of *Rex* v. *Menzies*, tried in 1916, it was alleged that the defendant had fabricated documents dating from 1719 to 1772 in support of his claim to a peerage. Certain alterations in these documents were demonstrated, and it was alleged that these had been made subsequently to 1914, a mixture of blue-black ink and an aniline red ink having, it was stated, been used for the purpose. On the other hand, evidence was given that the writing did not contain aniline dyes, and that old ink had therefore not been imitated in the manner suggested. As there was no proof that the alterations in the documents had been made subsequently to 1914, when the defendant had acquired them, he was acquitted.

This trial recalls an earlier case of a similar kind. In 1839 Alexander Humphrey was tried at Edinburgh on the charge of forging documents in support of his claim to the Earldom of Stirling. The margin of one of these documents, dated 1639, showed lines drawn in red ink, but it was officially proved that the use of such lines was not introduced into the Chancery Office until 1780. Evidence was also given that the ink in some of the attestations was a modern ink made to imitate ancient ink. Unfortunately, no details of the facts upon which this opinion was based have been preserved.

The use of aniline and other dyes in modern writing inks has increased the possibility of distinguishing between different kinds of ink in writing. Different ink-makers use different dyes in varying proportions as the "provisional colour" in their inks, and as these behave in a different way with chemical reagents, it is frequently possible to distinguish between them by tests applied to portions of the writing under controlled conditions.

For example, one ink will turn deep blue with a particular reagent which makes another ink violet, whilst one will be bleached with a second reagent which leaves the other practically unaffected. It is, of course, essential that such tests should only be made by a trained chemist, who knows how each possible constituent of an ink can behave under the same conditions.

As an instance of the value of these tests in criminal investigation, the case of *Rex* v. *Brinckley*, tried in 1907, may be cited. Brinckley, who was a carpenter by trade, had become friendly with an old lady named Blume. She died very suddenly, and Brinckley produced a will in which he was appointed her heir, and on the strength of this immediately took possession of her house and effects.

The surviving relatives of Mrs. Blume considered some of the circumstances suspicious, and accordingly obtained a caveat, by which the action of the will was suspended, a course of action which Brinckley had not anticipated.

One of the witnesses to the alleged will, a man named Parker, stoutly denied that he had ever signed any will, and asserted that the only paper to which he had put his signature was a blank sheet which Brinckley had produced in a public house, and on which he said he intended to draw up a petition for an outing.

Brinckley, thus finding that one of his "witnesses" did not intend to support him, decided that his course would be easier if Parker were out of the way. Accordingly he obtained a supply of prussic acid, which he placed in a bottle of stout, and left this in Parker's lodgings. Parker was not in, but his landlord and landlady, finding the stout in his rooms, drank it, and both died of prussic acid poisoning.

Parker was at first arrested, but was soon released, and his statement then led to the arrest of Brinckley on the charge of murdering Mr. and Mrs. Beck.

At this point the evidence of the document itself became a matter of the first importance. The ink was accordingly procured from the public house and scientifically examined in comparison with that in Parker's signature on the paper. It was a somewhat characteristic ink, containing a particularly brilliant blue dye, and the writing done with it agreed in all respects with the ink in the signature on the alleged will. There were, moreover, three kinds of ink upon the document, the body of the will being written in one kind of ink, and the signatures of the two sham witnesses each in a different ink.

At the trial the prisoner did not challenge the accuracy of these conclusions, but attempted to account for them, alleging that there were three kinds of ink in the house, and that he had given two of the bottles to a little girl, who naturally was not forthcoming. He was found guilty of the murder.

Questions as to the age of ink in writing are frequently raised. Sometimes, for instance, there may be reason for suspecting that the whole of a document was not written at the same time, or that the writing is not as old as it purports to be. Sometimes it is impossible to express any opinion on such points, but in other cases the facts may enable a definite conclusion to be formed.

It has already been mentioned that anachronisms in the composition of inks have often afforded conclusive evidence that writing is not as old as it purports to be. Other evidence may be afforded by the microscopical appearance of the ink. For many years after it has been applied to the paper an ordinary iron-gall writing ink will have a crystalline appearance, but eventually as it decomposes, becomes yellow, and shows patches of broken-up pigment. This appearance of the ink is frequently to be seen in writing of the eighteenth century (see Figs. 28 and 29, Plate IX.).

The divided nibs of a steel pen produce a characteristic effect, the lines showing darker margins (see Fig. 29). In the case of *Rex* v. *Menzies*, mentioned above, evidence was given that additions to a document, dated 1719, had been made with a steel pen, whereas, as steel pens were not invented until 1808, these portions of the documents could not have been genuine.

Probable inferences as to the age of writing may sometimes be drawn from the colour of the ink. The darkening process, already described, in which the ink becomes more or less black on exposure to the air, takes a considerable time before it is complete, and if the writing is kept in a closed book protected from the action of the light, the final intensity of colour may not be reached for upwards of a year.

Hence, if a record be taken by means of a tintometer of the original colour of an ink, and the writing subsequently darkens rapidly in colour, it may be regarded as fairly certain that the ink is comparatively recent. In one case in which this method was applied the ink in a document alleged to be two years old darkened very materially in the course of two or three days, and the document was thus undoubtedly a forgery.

In drawing conclusions from the colour of an ink, it is essential to take into consideration whether or not

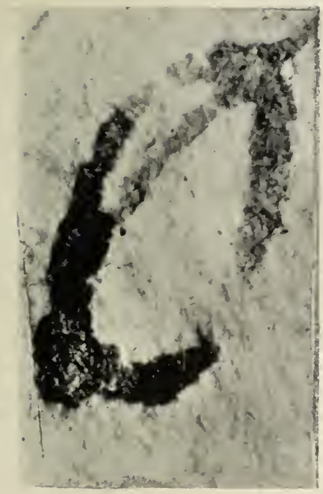


Fig. 28.

PLATE IX. INK IN WRITING OF 1723. × 20.

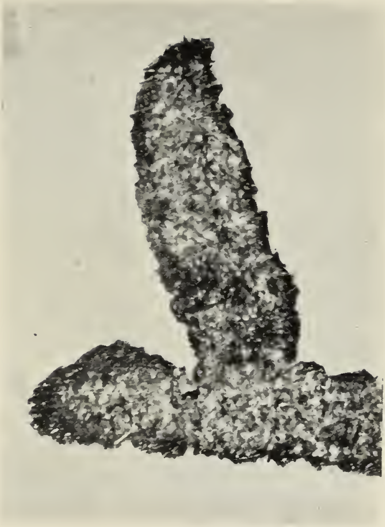


Fig. 29.

PLATE IX. MODERN BLUE-BLACK WRITING INK. × 20.

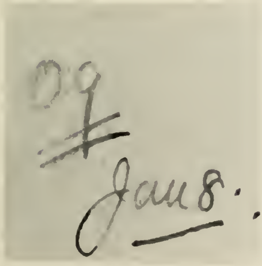


Fig. 31.

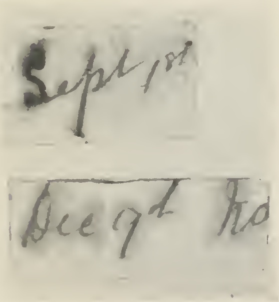


Fig. 32.

PLATE IX. EFFECT OF A REAGENT ON THE INK IN WRITING OF 1909 AND 1921.

To face page 118.]

the ink appears to have been blotted, for, inasmuch as ordinary blue-black ink contains two pigments, variable quantities of these will be removed in the process of blotting, and the colour of the ink on the paper will vary with the time that elapsed before the blotting paper was applied.

The importance of this point was shown in the case of *Rex* v. *Cohen.* A doctor was charged with "doping" a man to keep him out of the army. He asserted, however, that the man was a regular patient, and in support of the statement produced his books. The man's name appeared in some seven or eight entries, and, as it happened, the ink in all of these was paler than that in adjacent entries. Misled by this circumstance, a handwriting expert gave evidence that these entries were open to grave suspicion of forgery, and this led to Dr. Cohen being found guilty and sentenced to a fine of £100 and six months' imprisonment.

He appealed against this sentence, and at the hearing of the appeal it was demonstrated that the conclusion which had been based upon the colour of the inks in the entries was fallacious. It was shown that the final colour of a blue-black ink which had been blotted five seconds after writing was very different from that of the same ink blotted after the lapse of thirty seconds.

As the various entries in the books had obviously been blotted at different intervals after writing, some at the end of a series and others immediately after a single entry, this fact alone was sufficient to account for variations in the colours and intensity of the inks of adjacent entries.

A still more conclusive proof of the genuineness of the entries was afforded by a study of the sequence of the strokes in adjacent writing. When two pen-strokes in ink cross one another while wet there is usually a heavier deposit of pigment at the point of intersection, but it is rarely possible to determine which stroke is uppermost. If, however, the first stroke is dry before the second is applied, the two lines are generally quite distinct and it is then possible to decide, with the aid of the microscope, which stroke is uppermost, or, in other words, the more recent.

In the case of the doctor's day book, one of the alleged recent entries touched the entry immediately beneath it at two points, and in each instance the line came below and not above the intersecting line of the following entry. Hence there could be no doubt that this suspected entry was written prior to those in the long series of following entries, the genuineness of which was not challenged. The contention of the Crown could not be upheld in the face of facts such as these, and the sentence on the defendant was accordingly quashed (see Fig. 30, Plate X.).

In the case of iron-gall inks it is also possible, under certain conditions, to apply chemical tests to ascertain approximately the age of the writing. These tests are based upon the fact that the final black pigment of iron tannate takes a long time before it becomes finally stable. Hence, the ink when freshly applied to the paper will react rapidly with dilute chemical reagents, but after the lapse of a year or so will react much more slowly; and finally, after a period of six to ten years, will remain unaffected for a long time.

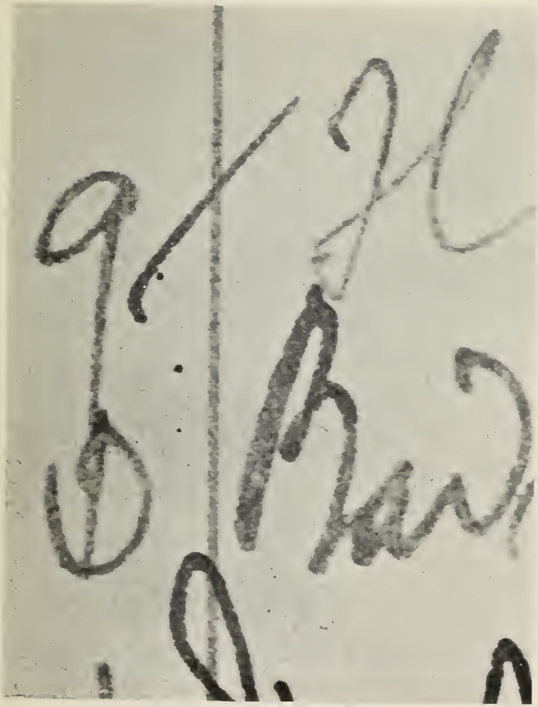


Fig. 30.

Plate X. Portion of Entries in Day Book (*Rex* v. *Cohen*). Showing Sequence of Strokes. × 6.

To face page 120.]

Although aniline blues, which are used as the temporary colouring matter in blue-black inks do not behave in this way when by themselves, it is interesting to note that when present in iron-gall inks they become enveloped in the final iron tannate, and are thus prevented from reacting in the case of old writing. In the case of comparatively recent writing the blue pigment will run over the surface and smudge the paper, and some idea of the probable age of the ink may be obtained from the speed and degree of smudging.

In forming any comparative estimate as to the age of inks in writing from the results of such tests, it is essential that the dates of the inks should not be too close to each other, that the inks should be of the same type, and that the differences should be very pronounced (see Figs. 31 and 32, Plate IX.).

All these conditions were present in the case of *Rex* v. *Pilcher*, which was tried in 1910. Colonel Pilcher had been on terms of great intimacy with his cousin, and fully anticipated that he would be her heir. When the lady died he produced a will, dated 1898, according to which the whole of the property was left to him. The validity of the will was disputed by the relatives, and ultimately Colonel Pilcher was accused of having forged it.

When chemical tests were applied to the inks on this document, it was found that the writing of every part of it, including the signatures of the supposed witnesses, reacted immediately with various reagents, and showed pronounced diffusion of the blue pigment, the colour spreading all over the paper.

On the other hand, a series of tests applied under parallel conditions to cheques which had been written by the alleged testatrix reacted rapidly, with much smudging, when the cheques were two or three years old, but only very slightly when they were four to six years old, and not at all after eight years. These results, which were confirmed by other tests, indicated that the ink on the will was certainly not twelve years old, and was probably, as an outside estimate, not more than four or five years old.

Colonel Pilcher ultimately confessed that he had uttered the will, knowing it to be a forgery, but had no knowledge as to how it had been forged.

In another notorious case (*Rex* v. *Seddon*), a will, written in ink, showed no indication of having been written at a date later than that stated upon it.

The use of invisible inks for secret writing has long been known, but has usually either been looked upon as a scientific plaything, or has been employed as a means of fraud.

For example, a few years ago a guileless-looking gentleman called at the laboratory of a well-known public analyst, and asked him if he could supply him with chemicals which would act as vanishing and reappearing inks to amuse his children.

The real use for which these toys were required became clear a few days later, when this indulgent father appeared in the Police Court on a charge of fraud on the turf. His method was to write the name of a horse on a betting slip, which would be retained by one of his clients, and upon which the name would subsequently fade, to be automatically replaced by

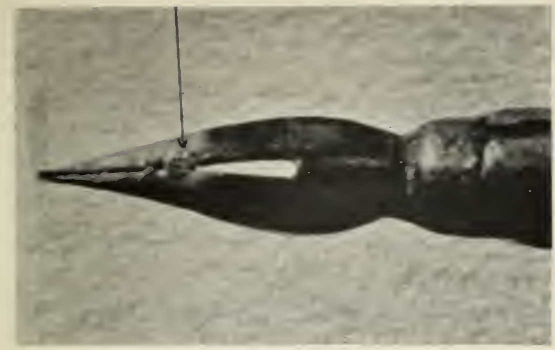


Fig. 34.

PLATE XI. PEN NIB MAGNIFIED TO SHOW PARTICLES OF ADHERING VEGETABLE MATTER (indicated by line).

Fig. 33.

PLATE XI. PEN USED FOR WRITING WITH LEMON JUICE.

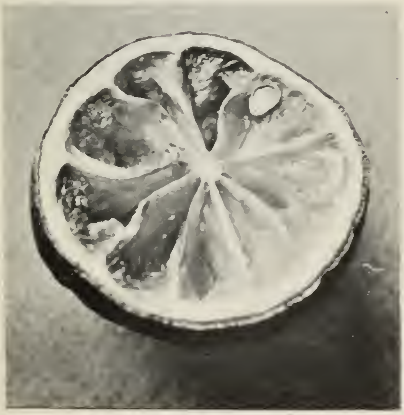
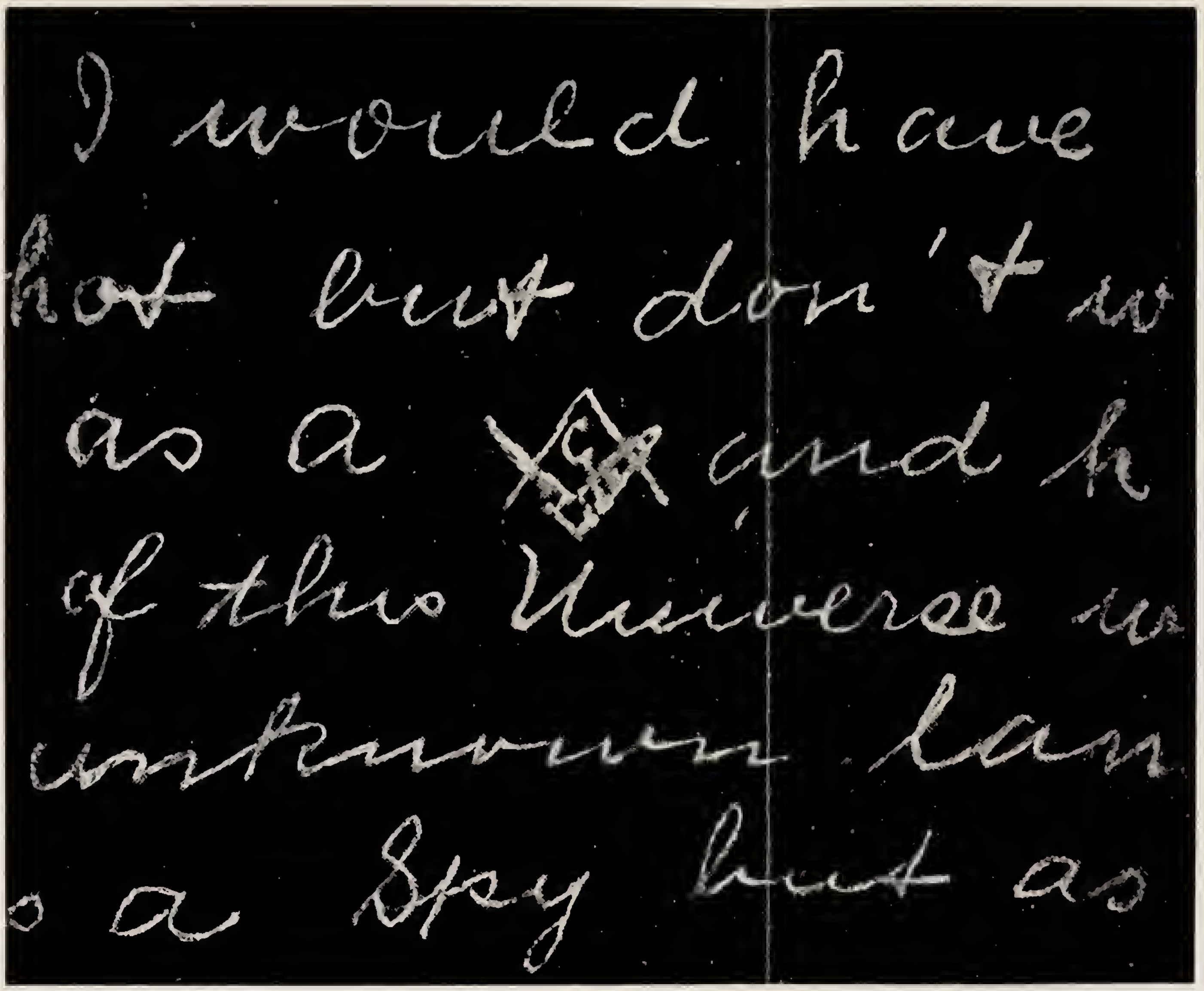


Fig. 35.

PLATE XI. LEMON INTO WHICH PEN NIB HAD BEEN DIPPED. The dark places show where reactions for iron were obtained.

To face page 122.]



I would have
hot but don't w
as a and h
of this Universe u
unknown lan
a Spy but as

Fig. 36.

PLATE XII. PORTION OF KUEPFERLE'S CONFESSION WRITTEN ON A SLATE. The design in the centre is a Masonic sign.

[Reproduced by permission.

To face page 122.]

that of another horse. The fraud was exposed by one of the intended victims, who observed the change taking place and hurried to the Police Station before it was complete.

Invisible inks were also used to some extent as a means of identifying documents. Thus, in a case which was tried in Surrey, a series of anonymous letters had been systematically sent to several people, and these, owing to a similarity in the handwriting, were attributed to an innocent person. The offender, who had also received similar letters, was finally detected by means of stamps marked with invisible ink, which were issued only to her and members of her household.

It was not until the war that inks for secret writing became, like so many other relatively unimportant materials, things of the first moment. Much of the work that was done in connection with this aspect of modern warfare was of necessity kept secret, but from time to time partial information on the subject was published in the public press.

It was stated, for instance, that a spy had been captured, whose collar was saturated with potassium ferrocyanide, so that by simply immersing the end of the collar in a little water an invisible ink would be obtained, which would become blue on the application of an iron salt.

In one or two of the early cases, the trials were held in public at the Old Bailey, and most of the evidence, including scientific details as to the method of secret writing, was reported in the press.

The case of *Rex* v. *Kuepferle* had many points of interest. Kuepferle, who was really a Captain in the German Army, attempted to convey to Germany particulars of the ships in the Irish Sea. He posed as a woollen merchant from New York, and wrote his information between the lines of an imitation business letter. This letter was regarded as suspicious, and was stopped by the postal censors, and when subjected to heat the previously invisible writing between the lines was developed in brown characters.

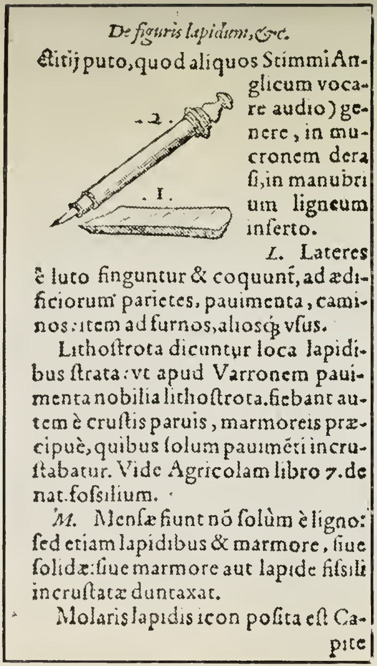
Meanwhile Kuepferle had been arrested in an hotel near Victoria Station, and in his room were found a cut lemon, a pen and a bottle of formalin. Chemical examination showed that a steel instrument, such as a pen nib, had been inserted into the lemon, and traces of fruit acid and of formalin were found upon the pen (Figs. 33, 34, 35, Plate XI.). The effect of the formalin was to make the lemon juice require a higher temperature than usual for its development in the writing.

Scientific evidence to this effect was given at the trial, and the witness, in cross-examination, was asked whether formalin could be used for the feet.

He replied that he had not heard of its being used in that way, but saw no reason why it should not be so used. Referring to this question in re-examination, Sir John Simon said: "Have you ever heard of formalin being applied to the feet by means of a steel pen?"

It will be recalled that Kuepferle, unable to stand the strain of the trial, committed suicide by hanging himself in his cell, and left a full confession as to his identity (see Fig. 36, Plate XII.).

Similar scientific evidence was given at the public trials of Müller and Hahn, both of whom had used



De figuris lapidum, &c.

ctitij puto, quod aliquos Stimmi Anglicum vocare audio) genere, in mucronem deraſi, in manubrium ligneum inſerto.

L. Lateres è luto finguntur & coquunt, ad ædificiorum parietes, pauimenta, caminos: item ad furnos, alioſq; vſus.

Lithoſtrota dicuntur loca lapidibus ſtrata: vt apud Varronem pauimenta nobilia lithoſtrota. fiebant autem è cruſtis paruis, marmoreis præcipuè, quibus ſolum pauimẽti incruſtabatur. Vide Agricolam libro 7. de nat. foſsilium.

M. Menſæ fiunt nõ ſolùm è ligno: ſed etiam lapidibus & marmore, ſiue ſolidæ: ſiue marmore aut lapide fiſsili incruſtatæ duntaxat.

Molaris lapidis icon poſita eſt Capite

Fig. 37.

Plate XIII. A Page of Gesner's Book (1565), Describing the use of Graphite, and Showing a Wedge of the Mineral, and a Black Lead Pencil.

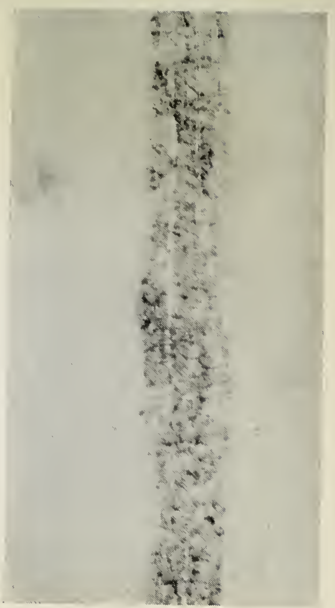


Fig. 38.

Plate XIII. Microscopic Appearance of a Mark made with Ancient Egyptian Graphite (about 1500 b.c.)

To face page 124.]

lemon juice for their invisible writing, but the details of the chemical agents used by spies subsequently captured were not made public.

It is interesting to note, however, that ingenious chemical methods of secret writing and development were well known by the Germans, and many of them had been published in German text-books long before the war. The use of saliva, for example, as a secret ink, is described at length by Dennstedt and Voigtländer, together with the most suitable methods of developing the writing by means of ordinary writing ink.

The ink upon a document affords many more possible clues than writing in pencil, although even in that case it is sometimes possible to distinguish between the writing done with different pencils by means of microscopical examination or chemical tests.

Prior to the modern discovery of graphite or black-lead, about the year 1560 (see Fig. 39, Plate XIII.), metallic lead was used as a pencil pigment, and the lines made with it may be readily distinguished under the microscope from those made with graphite pencils (see Figs. 40 and 41, Plate XIV.). The word "modern" applied to this discovery is used here advisedly, for Professor Flinders Petrie has given the writer a portion of a piece of graphite which he discovered in a tomb at Ghorub in Egypt. This dates back to about B.C. 1500, and is undoubtedly the oldest known specimen of the mineral. There is no evidence that the ancient Egyptians ever used graphite as a pigment, nor has any other find of the sort ever been made.

It is a decidedly impure material, containing much siliceous matter, and so produces marks characterised by irregular light striations, whereas graphite of a high degree of purity makes marks of a rich tone showing very few, if any, striations (see Fig. 38, Plate XIII.), and the metallic pigment is characterised by the occurrence of isolated brilliant patches marked with regular vertical striations.

The earliest known example of pencil marking on British MSS. in the British Museum is a drawing in the Stowe MSS., "Arms of Ancient Nobilities," of the early seventeenth century. The pigment in this consists of metallic lead, whilst in another Stowe MSS. (about 1630) the lines in the drawings were made with ordinary blacklead. In the Bodleian Library lines ruled on several old MSS. of the century are in metallic lead, and the earliest instance of the use of a graphite pencil is

Modern blacklead pencils are made from powdered graphite compressed with clay and wax, and the markings made with these pencils, again, can be distinguished under the microscope by their showing characteristic bead-like striations due to the sandy particles in the clay. By following the course of these striations it is frequently possible to determine which of two intersecting lines is uppermost, and so written the more recently (see Figs. 42, 43, Plate XV.) It is also possible to distinguish between pencil writing and its carbon copy by the fact that the marks in the copy show no striations (Fig. 44, Plate XV.).

Flaxman was in the habit of making drawings on the backs of envelopes, and a series of these, dating from 1800 to 1814, is preserved in the British Museum. In

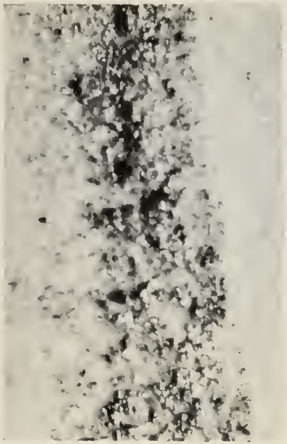


Fig. 39.

PLATE XIV. MARKING MADE WITH METALLIC LEAD. × 20.

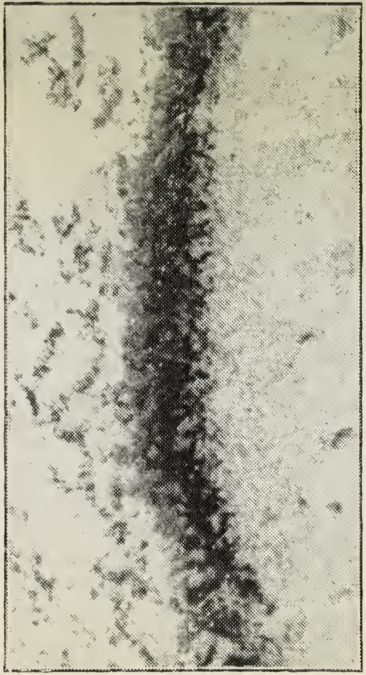


Fig. 40.

PLATE XIV. LINE IN DRAWING OF 1831. TYPICAL OF OLD GRAPHITE PENCIL MARKINGS.

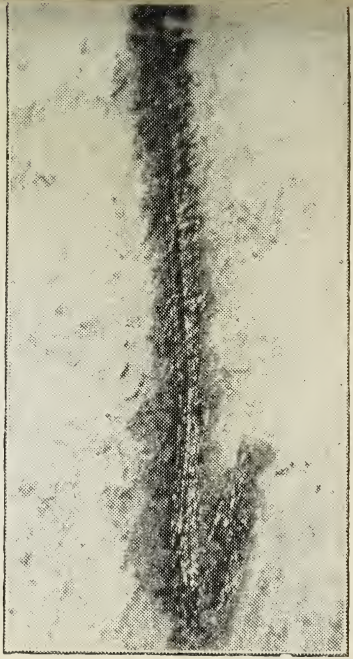


Fig. 41.

PLATE XIV. MARK MADE WITH BORROWDALE GRAPHITE USED FOR PENCIL MAKING IN 1851. NOW IN THE GEOLOGICAL MUSEUM. SHOWS IRREGULAR STRIATIONS DUE TO IMPURITIES.

To face page 126.]

every instance the pigment in these drawings consists of typical graphite, as cut from the block.

The composite clay process was invented by Conté of Paris about 1795, and it is interesting to note that a letter sent to Flaxman by the painter, Fleury Epinat, of Lyons, between 1805 and 1814, was written with a pencil producing marks characteristic of the modern type of composite pencil.

The nature of the pigments used in the so-called copying-ink pencils has on several occasions afforded valuable evidence in trials. These pigments consist mainly of methyl violet, or other aniline dye, mixed with blacklead and clay in variable proportions, and distinctive tests may be based on the varying behaviour of the pigments towards different chemical reagents. For example, in some cases the dye may be readily extracted with a solvent, whilst in others distinctive reactions for iron are obtained, and so on.

In the case of *Rex* v. *Wood*, tried in 1907, a woman was brutally murdered, and the only clue was a burnt card in the grate of the room. The words on this were written in copying-ink pencil in handwriting which, when reproduced in the press, was recognised as that of an artist named Wood. When arrested the man had a Swan copying-ink pencil upon him, and the question was thus raised whether the pigment of this pencil could have been used in writing the words on the fragments of the card (Fig. 45, Plate XVI.).

A series of systematic tests showed that the two pigments agreed in all respects in their chemical behaviour, and differed from those of the pigments of copying-ink pencils made by other manufacturers.

At the trial evidence was given to this effect, and ultimately Wood admitted that he had written the card, but he was found not guilty of the murder (see p. 20).

The degree of permanence of methyl violet in association with blacklead and clay has not been ascertained, although the dye by itself is well known to be fugitive. It is possible that under certain conditions the degree of fading might enable an estimate of the age of the writing to be formed.

In the case of *Macbeth* v. *King*, which was tried in 1916, the question of the fastness of copying-ink pencils was raised. The steamship "Membland" was presumably lost at sea early in 1915. Two months later the stave of a wooden bucket was washed ashore near Hornsea, and on this was written in copying-ink pencil the words: "Membland torpedoed engine room port side. Goodbye dear."

If this were genuine it would indicate that the vessel had been sunk by a German vessel; otherwise it had been lost by ordinary marine risks, and another set of underwriters would be liable.

At the Board of Trade enquiry it was suggested that writing in copying-ink pencil would not resist the action of sea water for two months. Experiments were therefore made with various kinds of pencil upon pieces of wood, which were immersed in salt water, frequently shaken and exposed to strong sunlight. The writing in each instance was quite legible after eight weeks, although slightly smudged in the case of one of the pencils. Hence there was in this contention nothing against the writing being a genuine document.

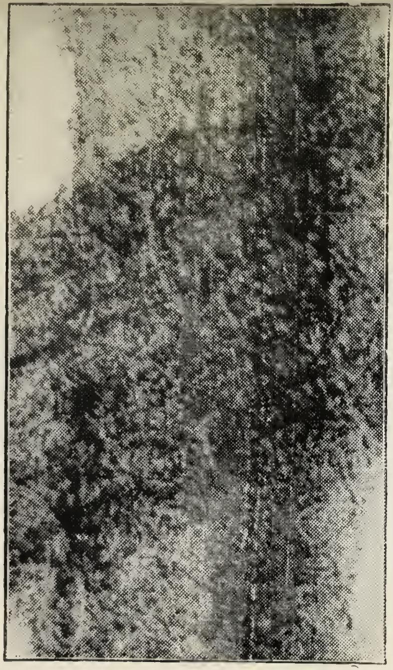


Fig. 42.

Plate XV. Marks made with a Faber's Pencil. Striations show Sequence of Strokes. × 20.

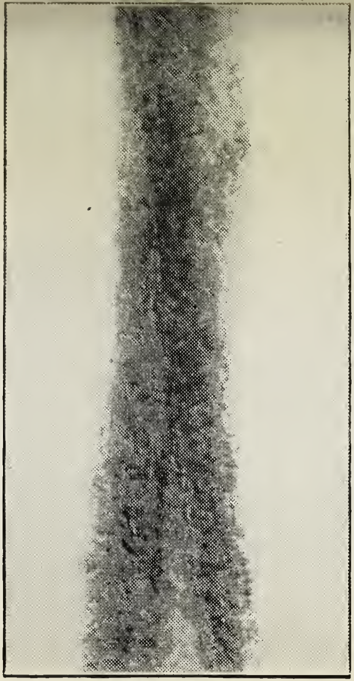


Fig. 43.

Plate XV. Marks made with Composite Pencil. Striations show Sequence of Strokes. × 20.

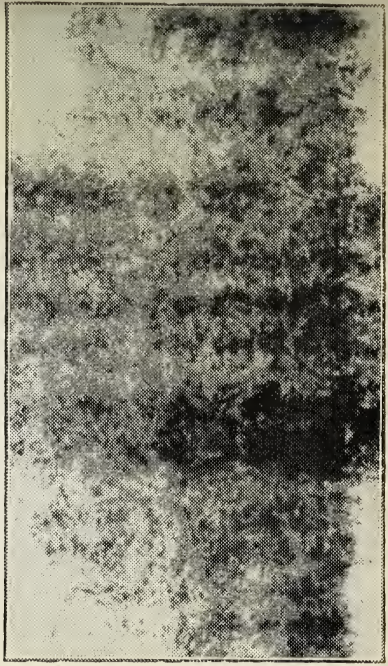


Fig. 44.

Plate XV. Marks in Carbon Copy of Pencil Writing. Shows Absence of Striations. × 20.

To face page 126.]

The judge, in giving his decision, remarked that conceivably the stave was genuine, although he was not convinced on the point; he decided, however, upon other grounds, that the ship had fallen a victim to war risks.

Among other points connected with a document, mention may be made of the fact that information may sometimes be obtained by examination of the sealing wax, or the receipt stamp on a bill, or the characteristics of typewriting in a letter.

In the case of *Rex* v. *Fink* (1911) the prisoner was charged with forging a cheque by altering the amount from £10 to £10,000. He asserted, however, that the amount of the cheque was only for £10 when he had posted it, and his suggestion was that the letter had been tampered with while in the post.

Now it had been sent to the bank in a registered sealed envelope, and had been followed by a letter, also in a sealed and registered envelope. A piece of red sealing wax was found in the possession of Major Fink, and on analysis this contained exactly the same amount of mineral matter, resins and vermilion as the wax in the seals on the envelopes, and quite different proportions from the Post Office sealing wax and five specimens of sealing wax bought at random. There could thus be little doubt as to the origin of the seals. After hearing the evidence upon this and other scientific points raised in the case, the jury found the prisoner guilty but insane at the time when he committed the forgery.

As an instance of the possibility of drawing deductions from a receipt stamp, a case may be cited in which a Jewish family insured their household goods and, in particular, a quantity of jewellery of considerable value. Being thus protected, they soon became the victims of enterprising burglars, and in this unfortunate affair lost all their jewellery.

In proof of their claim they produced various receipts from the jeweller, dated at intervals of a month.

There were numerous points of agreement between the first and the third of these receipts, but the most conclusive point was the fact that the right-hand edge of the receipt stamp upon the earlier bill coincided exactly with the left-hand edge of the stamp on the later bill. That is to say, wherever there was a long projection in one, there was a corresponding short projection on the other. Such perfect coincidence could hardly have been the result of accident, and, as it was most improbable that one of two adjacent stamps should have been kept for three months and then affixed to a second receipt to the same person, the insurance company considered that they were justified in refusing to meet the claim

With regard to typewriting, it may be mentioned briefly that each machine has its own idiosyncracies by which it may be recognised, and observations made by the writer have proved that letters written upon the same typewriter at intervals of a year will exhibit corresponding peculiarities.

It has sometimes been erroneously believed that it was not possible to trace the origin of an anonymous letter which had been typewritten, but, as a matter of fact, the evidence is usually much more conclusive

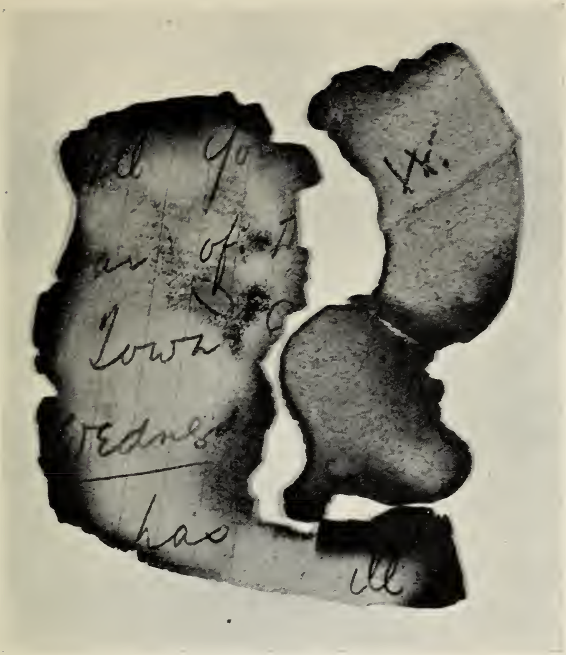


Fig. 45.

Plate XVI. *Rex* v. *Wood*. Charred Fragments with Writing in Copying-Ink Pencil, Found in Grate.

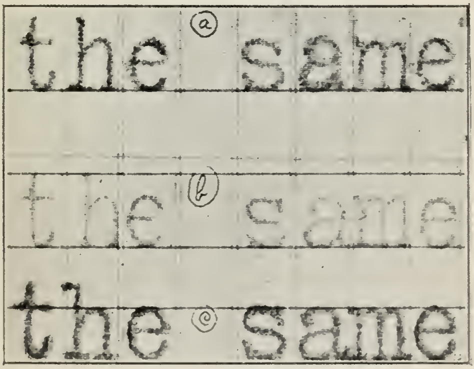

the (a) same
the (b) same
the (c) same

Fig. 46.

Plate XVI. Exhibits in the Risley Case, (*a*) Words from Risley's Copy of Disputed Affidavit. (*b*) Work of Risley's Machine. (*c*) Underwood Machine Altered to Produce Faults of Risley's Machine.

[To face page 130.]

than any which is afforded by a comparison of handwriting.

An interesting proof of the conclusive character of the evidence to be derived from an examination of typewriting was afforded by the Risley case, which was tried in 1911 in the Supreme Court of New York County.

In that case the defendant, Risley, had attempted to procure another machine which would show defective impressions matching those observed upon his own machine. He had instructed the mechanic of the manufacturing company to alter a machine left with him so that it had exactly the same faults of spacing, alignment and defective letters, the object being to show that there might be two machines which would agree in characteristics (see Fig. 46, Plate XVI.).

The mechanic was forced to admit, however, that notwithstanding all his efforts with chisel and file, he had not been able to make a machine showing exactly the same faults.

The mathematical probabilities of there being two machines of the same manufacture and having type of the same size and design, which should give impressions with identical defects was estimated by Professor Snyder, in his evidence at the trial, as one chance in 3,000,000,000,000.

CHAPTER IX

THE EXPERT IN HANDWRITING

EXPERTS in handwriting have come in for their full share of the strictures which have been passed upon expert evidence in general. One reason for this is that frequently in the past such evidence was given by men who had not been trained in the principles of science, and who had acquired the habit of drawing dogmatic conclusions from insufficient data. In addition to this, most of them were proved on some occasion or other to have been mistaken in their conclusions, and, as was pointed out in the first chapter, a deduction which can be proved to be wrong discounts the value of the evidence of the expert in subsequent cases, and incidentally tends to discredit all expert evidence.

Moreover, the doctrine of infallibility to which some of these early experts laid claim resulted in the whole system of the examination of handwriting acquiring a flavour of quackery.

This was well exemplified by a case in which Netherclift, a leading expert of the mid-Victorian days, was cross-examined by Lord Brampton (then Mr. Hawkins). He had given particulars of the methods used by him in his examination, and claimed that, when properly applied, they gave absolutely infallible results.

In answer to a further question, he replied that he had trained his son in his methods.

"So that," suggested counsel, "your son, working on your system, is as good as you are?"

"Yes."

"That is to say, he, too, is infallible?"

"Yes," asserted the witness.

"Well, now, Mr. Netherclift, have you and your son ever appeared on opposite sides in any case?"

After seeking in vain for an escape from his dilemma, the witness was obliged to admit that on one occasion he and his son had given evidence against each other.

To this came the inevitable and unanswerable retort: "How comes it then that two infallibles appeared on opposite sides?"

At one period Courts of Justice were inclined to attach an exaggerated weight to the opinion of the handwriting expert rather than to the consideration of the facts demonstrated by him. Fortunately, however, there is an increasing tendency for the services of the trained student of handwriting to be utilised in the proper manner—that is to say, in pointing out the characteristics of the writing in question, and stating the degree of probability attaching to the conclusions drawn from them.

A large share of the credit for this evolution of the system from what was often little more than ignorant pretension is due to Mr. A. S. Osborn, of New York. He has applied the most exact scientific methods to the examination of handwriting, and both in his writings and in his evidence has never ceased to lay stress upon the point that it is demonstration of facts and not opinion that is important. Yet, although scientific observation and measurements of the writing characteristics are essential, the judging of handwriting cannot be regarded as an exact science. It is rarely possible to state with certainty that a given piece of writing was written by a particular person who has not actually been seen to write it.

Usually in the case of anonymous letters, which are perhaps the documents on which the opinion of the expert is most frequently required, it will be found that the writing resembles that of the suspected person in some respects and differs from it in others; and it then becomes a matter of judgment whether the similarities or dissimilarities predominate.

If the handwriting has been disguised, the more obvious peculiarities of the writing of the suspected person will not be present, at all events at the outset, but the slighter characteristics which escape notice on casual observation will usually be found. On the other hand, if an attempt has been made to imitate the handwriting of the suspected person, the peculiarities of that writing will probably be introduced on the first possible occasion, whereas most of the minor characteristics will not be present.

In the recent notorious case of the *Bishop of Lincoln* v. *Wakeford*, an archdeacon was charged with immorality, and the decision depended largely upon the question whether the words "and wife" in the register of a Peterborough hotel had or had not been written by the accused. It was suggested by the defence that there had been a plot to ruin the archdeacon, and that the entries had been forged by someone who had access to the register.

Expert evidence was given to the effect that the ink and the writing characteristics agreed exactly with those of the admitted signature, but the witness was careful to point out that it would not have been absolutely impossible for these characteristics to have been reproduced, although, if the disputed writing was not that of the archdeacon, it must have been the work of an abnormally skilful forger. It was then a question for the Court to decide whether the circumstances were such that a skilled forger could have been brought upon the scene at the right moment. "It is not possible," said the witness, "to swear that anyone has written any given piece of writing. All that one can do is to point out the points of resemblance and of difference, and to state what probable conclusions may be drawn from them."

This method of presenting the evidence met with the approval of the Court, and the Lord Chancellor, in the course of the judgment, remarked: "This is the manner in which expert evidence on matters of this kind ought to be presented to the Court, who have to make up their minds with such assistance as can be furnished to them by those who have made a study of these matters, whether a particular writing is to be assigned to a particular person. Questions depending upon handwriting are in many cases doubtful, and in the past have given, and in the future will give, cause for great anxiety in courts of justice. But upon them, as upon other matters, it is necessary to come to a conclusion, and in this case the Board have no hesitation as to the conclusion which should be reached."

The necessity for extreme caution in drawing conclusions from even minute similarities or dissimilarities in handwriting become manifest if we consider the factors which contribute to this mode of expressing of thought.

There can be but little doubt that heredity contributes something to the form of writing movements, just as it does to peculiarities of speech and gait, and distinctive characteristics in the writing may appear in many successive generations.

In addition to this, the writing of each individual will owe something to the conditions of environment. The direct influence of the writing school, as exemplified by the "Italian hand" of early Victorian ladies' schools and the "Civil Service hand," will naturally influence the handwriting, and characteristics thus artificially acquired may eventually become by habit normal characteristics of the writing.

In addition to this, psychological influences such as anger, fear and madness all produce modifications in the writing and may even tend to cause it to revert to the original inherited form.

Apart from all these influences which may cause variations in a person's writing at different periods, the handwriting of two people quite unrelated to each other may show such close resemblances, even in minute detail, that they can be mistaken for each other.

The handwriting experts, Netherclift and Chabot, were undoubtedly close observers of detail, if we may judge by their published studies on the subject, and yet both of them were proved to have been mistaken in their deductions in the remarkable trial of Sir Francis Truscott, a former Lord Mayor of London, in 1879, on the charge of having sent a libellous postcard to a friend, accusing him of a criminal offence.

The writing upon the card was identified in the most positive manner as that of Sir Francis by a lady who knew him and was well acquainted with his writing.

Chabot then gave evidence that the writing upon the card resembled that in certain letters of the accused so minutely that they must have been written by the same person, and Netherclift swore that he had no doubt as to the card having been written by the accused.

For the defence a man named Smith was put into the box, and he swore that he had himself written the card, and that at soon as he learned that someone else had been accused of doing it he had voluntarily come forward. Evidence was also given by the father of this witness that the libellous post card was in the handwriting of his son, and by other witnesses, that it was in the handwriting of Smith and not of Sir Francis.

A still more notorious case was that of Beck, which has already been cited as an instance of mistaken identification. By a curious coincidence Beck also showed characteristics in his writing similar to those of the writing of the man for whom he had been mistaken, and corroborative evidence on this point contributed materially to the wrongful verdict.

In fairness to the expert witness in this case, it should be added that some of the writing submitted to him for comparison as genuine writing of Beck was in reality writing of Smith, and that had he been allowed to give the whole of his evidence, Beck would probably have been acquitted at the first trial.

After this palpable miscarriage of justice had become almost as familiar as a proverb, being quoted in every case in which questions of handwriting were involved, there was for some years a tendency in courts of justice to dispense altogether with the assistance of an expert, and to rely solely upon the testimony of relatives or of people, such as bank clerks, supposed to be especially familiar with the particular handwriting. This was in practice a reversion to the process in use prior to the admissibility of the evidence of experts in handwriting, some seventy years ago. The direct evidence of a witness who had seen the writing being done, or of one who, from constant association with the writing in correspondence, was supposed to be thoroughly acquainted with its distinctive features, was permissible, whereas the indirect evidence afforded by a study of the disputed writing in comparison with admitted specimens was not admitted, except in the case of ancient documents, or where a document with writing admittedly genuine had already been produced in evidence.

One of the earliest recorded instances of such evidence by relatives and acquaintances was at the trial of Spencer Cowper in 1699 for the murder of Sarah Stout, reference to which was made on a previous page (p. 59).

It was suggested by the defence that the girl had not been murdered at all, but had drowned herself while suffering from depression, and in support of this view several recent letters of hers to a man other than the prisoner were produced, and evidence was given by a man named Beale that he believed that these letters were in the handwriting of the deceased, since he had seen her write and had in his possession a receipt signed by her.

As against this evidence, the mother and brother of Sarah Stout emphatically declared that the letters were not in her handwriting, since they were not compatible with her character.

In reply to the judge's question, Mrs. Stout replied: "How should I know! I know she was no such person; her hand may be counterfeited."

"But," remarked the judge, "if it were written in her more sober style, what would you say then?"

"I shan't say it to be her hand," answered Mrs. Stout, "unless I saw her write it."

The dead girl's brother also agreed, saying: "It is like my sister's hand, but I don't believe it to be her's, because it don't suit her character."

In his summing up the judge referred to this conflict of opinion, and remarked that if the jury came to the conclusion that the letters had been written by Sarah Stout, "there was evidence to show that, although she was a virtuous woman, a distemper might have turned her brains and decomposed her mind."

Proof of handwriting of the same kind was admitted at the trial of the twin brothers Perreau in 1775 for forging a series of bonds signed with the name of "William Adair."

At the trial Caroline Rudd gave evidence that she had forged the bonds at the instigation of the two brothers, whilst they asserted that they had been deceived by her and had received the bonds from her believing them to be genuine.

Evidence that the handwriting on the bonds was not that of William Adair was given by his brother and by a clerk. For the defence it was stated by John Moody, a servant of one of the Perreaus, that Mrs. Rudd had two distinct styles of handwriting, and that she used one of these to write letters to his master purporting to come from Mr. Adair. He also asserted that the handwriting upon the bonds was exactly the same as that of the fictitious letters.

The brothers were found guilty of the forgery, and, notwithstanding the doubts of the public, resulting in a petition to the King, and the strenuous efforts on their behalf by Sir John Moore and other distinguished men, they were executed in 1776.

Prior to their execution, Caroline Rudd was tried on the same forgery charge, and John Moody repeated the evidence he had given at the former trial, asserting that he believed the name of "William Adair" on the bond to be in the handwriting of Mrs. Rudd. In cross-examination, however, he admitted that he had never seen the prisoner sign that name. The defence was that there was a conspiracy on the part of the Perreaus, their relatives and friends, and evidence to this effect was given. Mrs. Rudd made a speech in her own defence, and, after a short deliberation, the jury found her "not guilty."

These cases are typical of the only sort of evidence on handwriting that was, as a rule, formerly available. In 1836 in the case of *Doe d. Mudd* v. *Suckermore*, an attempt was made to introduce a more skilled opinion. The question at issue was the writing upon a will, and a bank inspector was asked to attend the court and examine writing admitted by a previous witness to be genuine, and then to compare it with the writing upon the will. Apart from the opportunity of making these comparisons in court, the witness was not acquainted with the genuine handwriting, and his evidence was accordingly rejected by the judge.

This was made the grounds of an appeal to the Court of Queen's Bench, the judges of which were equally divided in their opinion. According to Lord Denman, such evidence was to be considered of little value, and the attempts to introduce it had been so much discountenanced that this chapter might be considered as expunged from the book of evidence.

The conflict of legal opinion on the point, however, foreshadowed an alteration in the law, and in 1854 a Statute was passed permitting the evidence of an expert comparison of disputed writing with that upon documents proved to be genuine to be given in civil cases, although it was not until 1865 that the same rule was extended to criminal cases.

It is interesting to note that one outcome of this extension of expert evidence was a decision upon the liability of a witness under the law of libel for statements made by him in the witness box. This leading case of *Seaman* v. *Netherclift* (1876) arose out of a probate action in which Netherclift had given evidence that a will was "a rank forgery." There was strong evidence to the contrary, and the jury found that the will was genuine, while the judge (Sir James Hannen) made some caustic comments on the expert evidence.

Shortly afterwards Netherclift was again called as witness in a forgery trial, and in cross-examination was naturally confronted with the judge's remarks in the previous case, and persisted in saying that he still believed the will to be a rank forgery and should so believe until his dying day. Thereupon Mr. Seaman, who was the solicitor who had drawn up and attested the will, brought an action for libel, and was awarded £50 damages. Netherclift appealed against the verdict, and in giving his decision the Lord Chief Justice (Cockburn) laid down the rule that a witness is absolutely privileged in his statements, even though they are malicious, and this ruling has been accepted ever since.

At the present day use is made of both methods of handwriting evidence, but it is not a difficult matter to show that the evidence of the relative or friend is more liable to error than the conclusion of the expert. The idea underlying such evidence is that there is a sort of "general character" about writing by means of which any one who is familiar with a given person's writing will be able to form an instinctive judgment as to whether or no a disputed specimen was written by that person, just as one can often recognise a person's face instantly by the sum of its distinctive features.

It is not an unfamiliar occurrence in the courts for a witness of the "friend" type to be seen staring at a piece of writing handed to him in the witness box, apparently waiting for inspiration to come to him as to its "general character," and then solemnly to pronounce an opinion, which is as often wrong as right.

The truth is that such a witness unconsciously looks for certain definite features of formation in the writing with which he has gradually become familiar, and he goes through an elementary process of comparison with the standard fixed in his memory. A clever forger can readily reproduce this so-called "general character" of a writing, and, if still more skilful, may reproduce even the minor and less obvious characteristics.

No more striking instance of the fallibility of evidence of this type can be found than was seen at the Board of Trade enquiry into the loss of the steamship "Membland" (see p. 128).

The writing on the wooden stave agreed closely in all its characteristics with the writing of one member of the crew, whose mother, however, declared that it was not his, possibly owing to its being written in pencil on rough wood.

On the other hand, the relatives of no fewer than six of the other members of the crew readily recognised the writing as that of their respective husbands or brothers. So much for recognition of handwriting by "general character"!

In fact, it frequently happens that people cannot recognise the "character" of their own handwriting. Mr. Justice Wills, in his *Circumstantial Evidence*, recalls a case involving the forgery of bank notes, in which a banker's clerk swore positively that he had written his name on one of the forged notes, whereas he spoke with hesitation about his genuine signature.

Another instance of the same kind occurred at the trial of a solicitor named Shaw in 1861. He was charged with forging a document, and at the trial a client of his named Abel had no hesitation in swearing that he (Abel) had signed the forged signature, whereas he disowned his genuine signature upon another document.

The judge in the case of *Tunnicliffe* v. *Oldcorn*, heard in the Chancery Court in 1911, probably had this uncertainty in mind when he refused to accept the evidence of a witness who had repudiated his signature to a document. This gentleman had stated that he had no recollection whatever of witnessing any such agreement, and while he agreed that his memory was not very good, he thought he would certainly have recalled an event of such importance. In cross-examination he pointed out particulars in which this signature did not agree with his writing, but this part of the evidence did not carry weight with the judge, since the witness was not a handwriting expert. He therefore decided that the agreement was genuine, and found in favour of the plaintiff, but this decision was unanimously reversed upon appeal, the judges of the higher court concluding that the document was a forgery.

From what has been said it will be gathered that the weight attached to expert evidence varies in different courts, and that this is likely to be the case until it is recognised that the real function of the expert is to supplement the knowledge of the court rather than to give a dogmatic opinion on the question at issue. The ultimate decision in every case rests with the judge or the jury, and the more fully the expert can put before them all the facts upon which a conclusion has to be based, the greater is the real value of his evidence. It is for this reason that it would be advisable to have the expert in handwriting appointed by the Court, rather than that he should be retained, as at present, by the prosecution or the defence, although this would be equally desirable for other classes of expert witnesses.

It was mentioned above that exceptionally there are cases where the expert can put forward an opinion to which so great a probability attaches that the conclusion is, for all practical purposes, a certainty. An example of these cases is to be found in the imitation of a signature by tracing it—a form of fraud which appears to be more common in the United States than in this country. The use of this means of reproducing writing is not always easy to detect, and it requires a skilful microscopical examination of the edges of the lines to find the irregularities due to the indecision almost invariably accompanying a tracing. In some notorious cases, however, the original copy has been found, or the too close similarities in form between several signatures have shown that they could not all have been genuine.

The most accurate scientific methods of demonstrating the coincidences in traced writings have been devised, such as for example, photography beneath glass ruled with measured squares, and the mathematical probabilities of accidental coincidence have been calculated and stated in evidence.

For example, an American counsel, in the course of his speech in a trial of this kind, remarked: "It has been said that if a person meet in a waste place three trees growing in a row, he thinks that they were so planted by man; should he find the distances equal, he is convinced. Such accidental situation of thirty trees would not exceed in strangeness a coincidence like the one in this case." In this trial, known as the Sylvia Anne Howland case, evidence was given as to the coincidence in position of all parts of the letters in the disputed and genuine signatures, and Professor Pierce, of Harvard, stated in the witness box that the probability of all the thirty downward strokes in the two signatures so coinciding would be one chance in nine hundred and thirty-one quintillions.

The writer is indebted to Mr. A. S. Osborn for the details of a celebrated trial in which he demonstrated that it was practically certain that four disputed signatures on a will were tracings. Some twenty years ago a man named Rice died suddenly in New York, leaving an estate valued at about five million dollars. The day after his death cheques for several hundred thousand dollars were presented for payment by an attorney named Patrick. These cheques were regarded as suspicious, and Patrick was arrested, and put on trial for the murder of the old man. The jury found him guilty, and he was sentenced to death, though the sentence was afterwards commuted to penal servitude for life.

After presenting the cheques, Patrick had produced a will, according to which the remainder of the estate was left to him, and this claim was tried in the civil courts simultaneously with the criminal trial.

This alleged will consisted of four pages, each of which bore the signature "W. M. Rice." All four signatures showed throughout remarkable coincidences

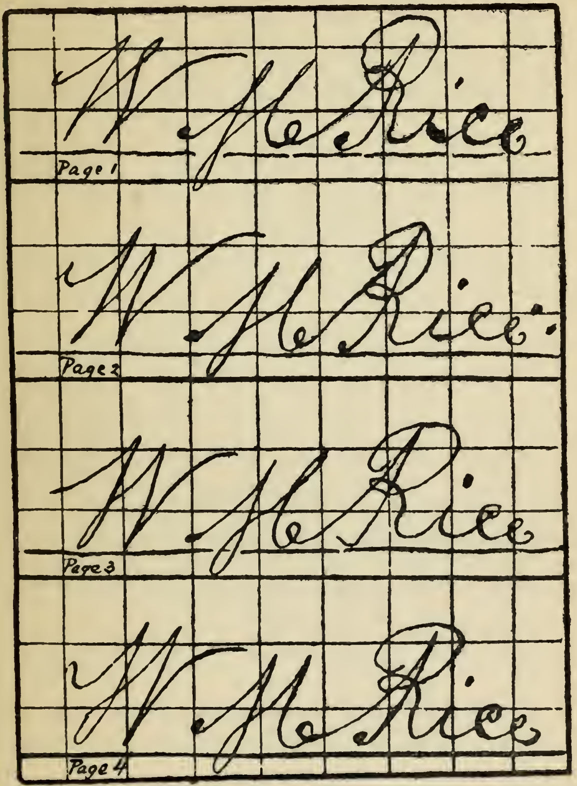


Fig. 47.
Four traced signatures in the Rice-Patrick Case.

in form, whilst, on the other hand, five genuine signatures of Rice, written on the day upon which the will was supposed to have been signed, showed pronounced variations in size, form and intensity, and when photographed under glass with ruled squares, the different parts of the letters did not occupy the same relative positions (see Fig. 47).

The court, having had these facts demonstrated to them, pronounced the will a forgery, and the same judgment was given unanimously in two courts of appeal to which the case was carried.

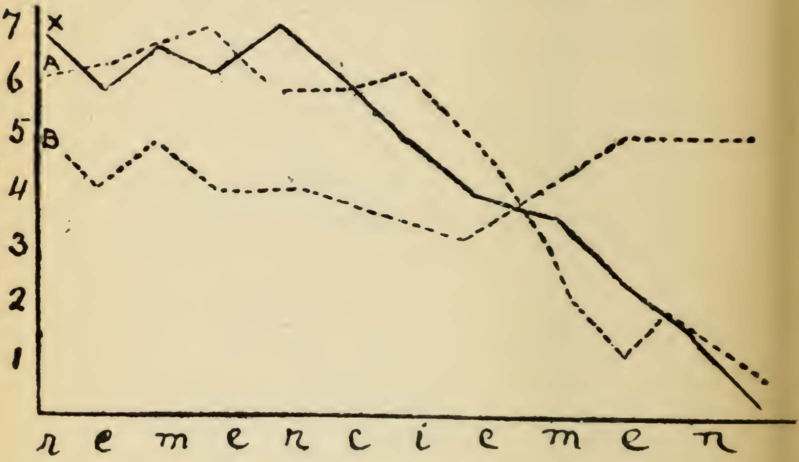


Fig. 48.

Diagram illustrating Locard's method of Graphometry.

In the final judgment it was stated that "Upon a critical examination of the four signatures, it will be found that they correspond almost exactly—a correspondence which could not possibly happen in the case of a person upwards of eighty years of age."

It is not always possible, however, to demonstrate with such completeness that a disputed signature has been traced, and where there is only one signature involved, and the model cannot be found, and there is no sign of prior pencil writing, the proof of tracing must, as a rule, lack completeness, and the evidence will then be subject to the same limitations as other evidence upon handwriting.

The modern quantitative methods of examining handwriting originated with Persifor Fraser, in America, some twenty years ago, and have since been developed by Dr. E. Locard, Director of the Police Laboratory at Lyons.

They consist, in brief, of measuring the heights of the letters in relation to each other, of parts of letters in relation to the whole letters, and of the height of the angles formed by the uprights of the letters in relation to the heights of the letters. Many similar relative measurements can be made and a series of ratios obtained, which can be plotted in curves. The results thus obtained are more conclusive than those given by a mere comparison of form, since they include details which would be overlooked by an untrained person.

One of the quantitative comparisons upon which Dr. Locard places great value is based on the fact that the height of the letters in a word (omitting letters such as *p* or *d* which extend far above or below the line) increase or decrease in size from the beginning to the end of the particular word, and that this gradation tends to be a constant which can be expressed in the form of a diagram.

Dr. Locard illustrates this gradation by reference to the word "remerciement" (see Fig. 48), in which the heights of each of the succeeding letters are connected by lines at the right points. For taking measurements such as these the writing is best enlarged several diameters; for as the method depends on relative and not absolute values, it is immaterial what is the size of the writing. One way of measuring

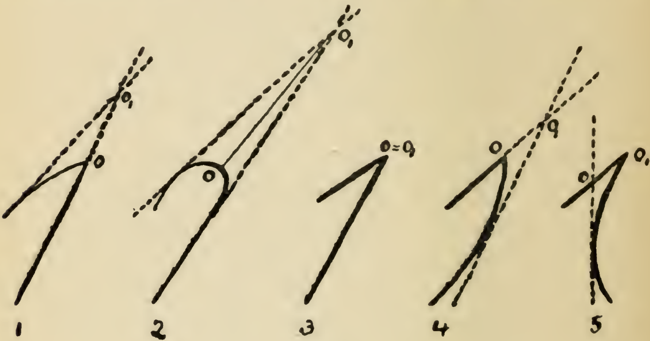


Fig. 49.
Locard's method of measuring the angles of letters.

the angles formed by the letters is shown in the diagram (Fig. 49), in which in each case the length of the line o, o, is measured and compared with the height of the letter itself, thus obtaining what Dr. Locard terms the "curvimetric index." One objection to this form of measurement is that a slight variation in the tangent at which the straight line is drawn in relation to the curve of a letter makes a good deal of difference in the value, and this measurement is therefore less accurate than the gradation value.

The differences in the angles formed by parts of letters in a word are strikingly shown in the diagram (Fig. 50). These angles depend not only upon the deviation of the various parts of the letters from the perpendicular, but also upon the spacing between the letters, and are often very characteristic for a particular writing.

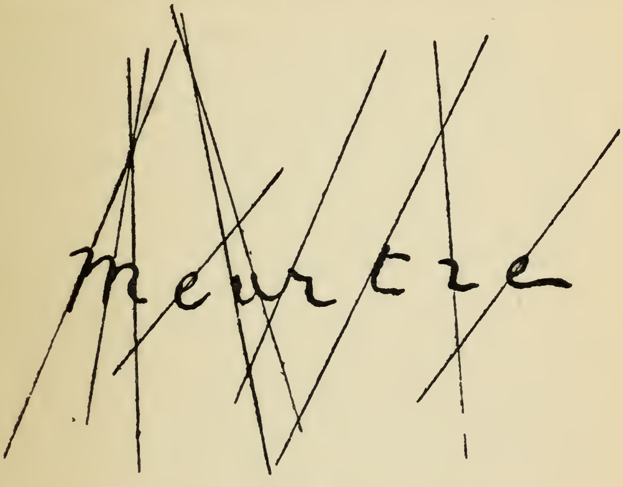


Fig. 50.

Locard's method of measuring the angles of letters in relation to each other.

Another distinctive feature is the number of times in which the pen can be seen to have been raised from the paper in words of one, two, three and four syllables, and so on, and evidence is also obtained by the number of times in which the dots of the "i" are formed in particular ways, such as vertical stroke. dash, point, etc.

CHAPTER X

EXPERTS IN ART

ALTHOUGH an artist who gives evidence on the authenticity of a disputed picture or upon its merits as a work of art, has to base his opinion on definite facts, those facts are often not so readily demonstrated as in cases of disputed handwriting. Everyone can compare for himself the points of resemblance or difference in writing when they have once been pointed out, but the differences between a good and a bad painting are, as a rule, more or less completely grasped only by those who have acquired considerable knowledge of the subject.

It is, for example, almost inevitable that a picture which is photographically exact in all its detail, but which lacks any touch of the personality of its painter, will make a greater appeal to the untrained eye than one which, while less exact in minute detail, conveys an impression of how the subject appeared to the artist at that particular moment, and in which he has tried to reproduce not only what he saw, but something of what he felt. The definition of art as "an expression of beauty in any medium athwart a temperament" would be meaningless to the average citizens from whom juries are chosen, and yet cases in which such fundamental principles are involved have not infrequently to be settled in courts of law before tribunals which are incapable of judging the point at issue.

Hence it follows that in such cases it is largely a matter of luck which side will win the day, and the victory may be gained on some minor issue quite apart from the merits of the dispute.

The difficulties experienced by a mixed jury in coming to a decision on questions of this kind were well illustrated in the case of *Belt* v. *Lawes*, which was tried in 187 .

Lawes had written an article in a society journal, accusing Belt, who was a fashionable sculptor, of doing his work through the agency of a "ghost." It asserted in so many words that he was quite incapable of producing unaided the work attributed to him, and that any artistic merit in his sculptures was due to the man in the background.

To clear his name as an artist, Belt was forced to bring an action for libel, and as a proof of his ability consented to do a sculpture in the presence of the jury, and an amusing note was introduced by his suggesting that the subject of the test should be the presiding judge. His Lordship, however, declined the honour, and it was finally settled that he should produce a bust of an Italian gentleman who had originally sat for one of his best-known sculptures. This work was done by him under the surveillance of the court during the course of the lengthy trial, and the jury strolled into the small adjoining room from time to time to follow its progress.

When finished, it was obviously a good likeness, as the jury could see for themselves. The defence, however, urged that it entirely lacked the qualities which distinguished the work of the original bust, and evidence to this effect was given by Leighton, Millais, Thorneycroft, and most of the leading artists of the day, who attempted to explain to the jury the points in which the second bust was inferior to the first. They also tried to demonstrate the impossibility of one hand having been responsible for both the good and the bad work to be found in many of the plaintiff's admitted productions.

On the other hand, rebutting evidence was given by those who had seen the sculptor at work on some of the busts, and this outweighed the expert evidence of the artists upon the merit of the work in question.

The alleged "ghost" also gave evidence, and the payment to him of a large sum of money was proved, but it was explained that this was in payment for cartoons prepared for cathedral windows.

Ultimately the jury found for the plaintiff, to whom they awarded damages.

In this case the expert evidence for the defence was overwhelming in its weight, and was nevertheless rejected by the jury, who preferred the deductions drawn from the evidence of their own eyes. Whenever the merit of a picture or other work of art is the question at issue, the jury have to base their verdict mainly on the weight of opinion which each side is able to put forward, and their conclusion will probably be influenced, if not decided, by the evidence of the artists whose work is most popular or whose name is the most widely advertised. Indeed, it is difficult to see how this could be otherwise.

In particular, when the subject of the action is the work of a painter whose methods are in advance of those of the great majority of artists of his day, it is obvious that an average jury will not be competent to form any opinion of the merits of the work in question, and that they will have a bias towards the style of painting with which they are most familiar.

The most celebrated instance of this kind which can be cited is the action for libel brought by Whistler against Ruskin in 1877.

Ruskin had published a criticism of Whistler's pictures, which had recently been exhibited at the Grosvenor Gallery, and, after expressing his disapproval of them in his usual violent language, concluded with the words: "I have seen and have heard much of Cockney impudence before now, but never expected to hear a coxcomb ask two hundred guineas for flinging a pot of paint in the public's face."

The action to decide whether these words were libellous was tried before Baron Huddleston and a special jury, and it was obvious from the outset that the sympathies of both were with Ruskin, whose reputation as a prophet of art was then at its height.

Whistler was cross-examined by the Attorney-General (Sir John Holker) upon his pictures, but his replies were obviously over the heads of the jury.

Attorney-General: "I suppose you are willing to admit that your pictures exhibit some eccentricities. You have been told so over and over again?"

Whistler: "Yes, very often."

Attorney-General: "You send them to the Gallery to invite the admiration of the public?"

Whistler: "That would be such a vast absurdity on my part that I don't think I could."

Attorney-General: "Can you tell me how long it took you to knock off that 'Nocturne'?"

Whistler: "I beg your pardon?"

Attorney-General: "I am afraid I am using a term that belongs to my own work."

Whistler: "Let us say then how long did I take to 'knock off'—I think that is it—to 'knock off' that 'Nocturne' . . . I had better say I was two days at work on it."

Attorney-General: "The labour of two days, then, is that for which you ask two hundred guineas?"

Whistler: "No, I ask it for the knowledge of a lifetime."

A picture of Battersea Bridge, described as "A Nocturne in Blue and Silver," was then produced, and the jury tried to examine it upside down.

Whistler: "It represents Battersea Bridge by moonlight."

The Judge: "Is this part of the picture at the top old Battersea Bridge? Are those figures on the top of the bridge intended for people?"

Whistler: "They are just what you like."

The Judge: "That is a barge beneath?"

Whistler: "Yes. I am very much flattered by your seeing that. The picture is simply a representation of moonlight. My whole scheme was to bring about a certain harmony of colour."

The Judge: "How long did it take you to paint that picture?"

Whistler: "I completed the work in one day, after having arranged the order in my mind."

With reference to the *Nocturne* (*The Falling Rocket*),

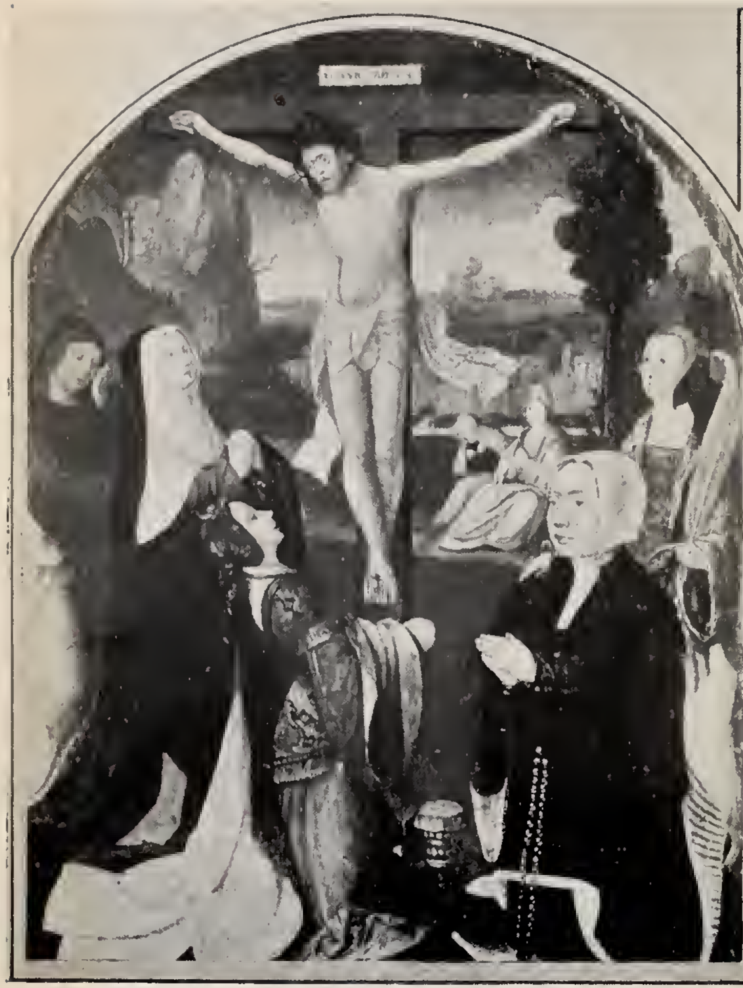


Fig. 51.

Plate XVII. Ordinary Photograph of Picture of "Crucifixion." By Cornelis Engelbrechtsen.

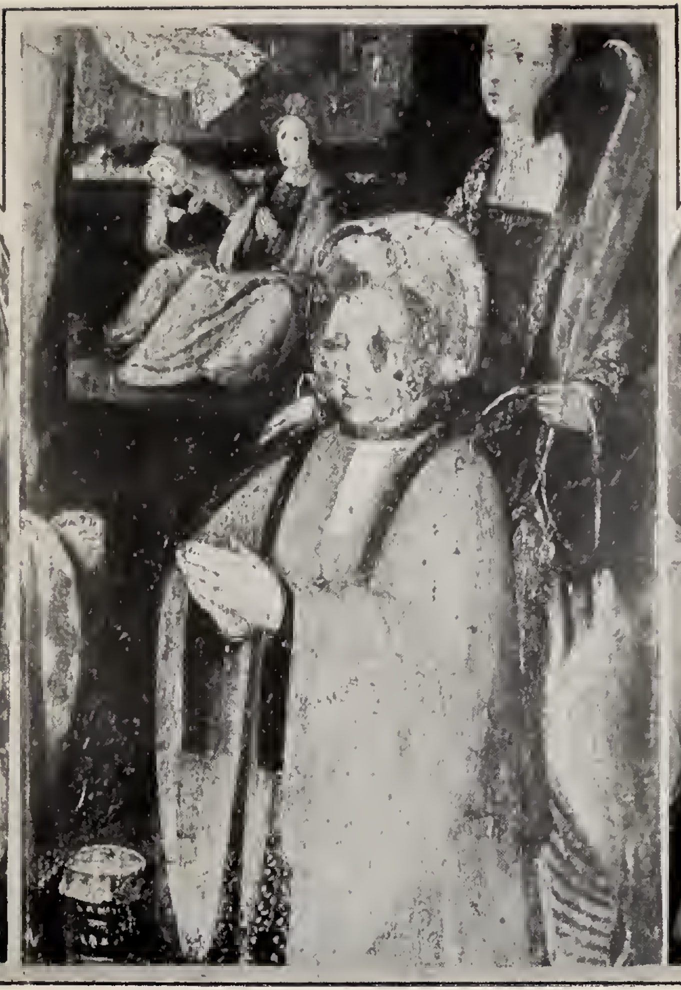


Fig. 52.

Plate XVII. Radiograph of the same Picture.

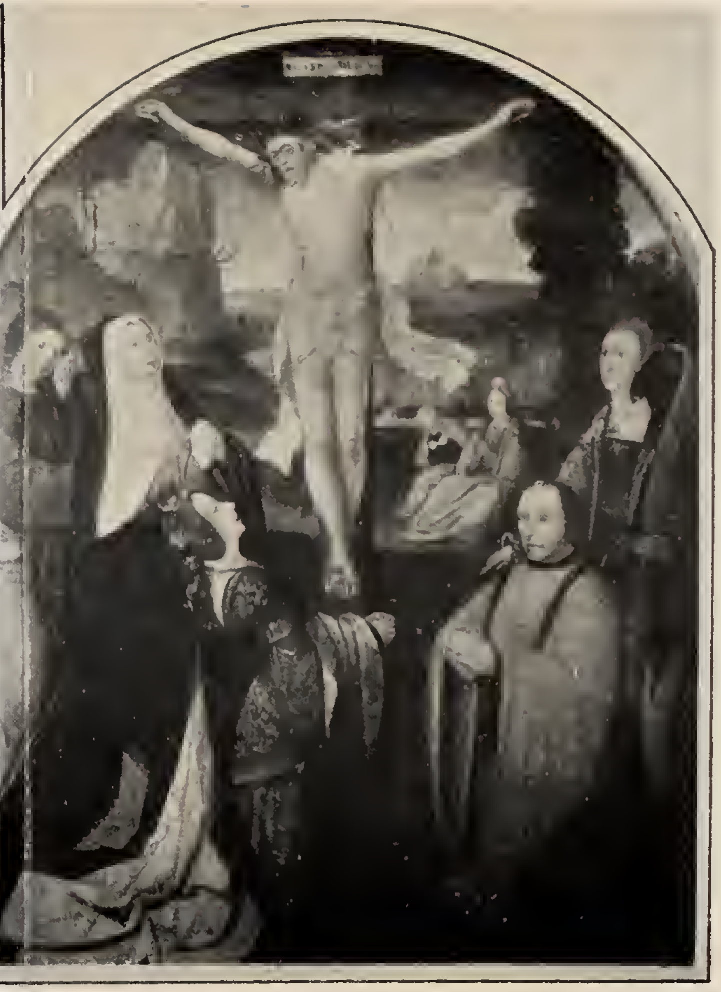


Fig. 53.

Plate XVII. Picture Restored in Accordance with the Evidence of the Radiograph.

To face page 156.]

which was the picture that had attracted Ruskin's denunciation by being priced at two hundred guineas, Whistler was asked whether he thought it fair that Mr. Ruskin should come to the conclusion that it had no particular beauty.

He replied: "What might be fair to Mr. Ruskin I cannot answer. No artist of culture would come to that conclusion."

William Michael Rossetti, who had been subpœnaed, gave evidence to the effect that he did not admire *The Falling Rocket*, that it was not a gem, nor an exquisite painting, nor very beautiful, but that it was a work of art, and was worth two hundred guineas.

Albert Moore then gave evidence that in his opinion Whistler's pictures were beautiful works of art, and that no other painter could have succeeded in them as Whistler had. When asked if there was eccentricity in the pictures, he replied: "I should call it originality."

The Attorney-General, in his speech for the defence, remarked that if Whistler based his reputation on the pictures which had been produced, he was a mere pretender in the art of painting.

Burne Jones, who was the first witness for the defence, said that he considered Whistler to be an artist, but that he regretted the want of finish in his work. In his opinion the picture produced was a work of art, but an incomplete one. In his judgment, Whistler had evaded the great difficulty of painting, and had not tested his powers by carrying it out.

Frith, the well-known Academician, was then called, and was examined by Mr. Bowen.

Counsel: "Are the pictures works of art?"

Frith: "I should say not."

Counsel: "Is the *Nocturne in Blue and Silver* a serious work of art?"

Frith: "Not to me. It is not worth, in my opinion, two hundred guineas. Old Battersea Bridge does not convey the impression of moonlight to me in the slightest degree. The colour does not represent any more than you could get from a bit of wall paper or silk."

Tom Taylor, art critic of *The Times*, said that the *Nocturne in Black and Gold* was not a good picture. He attempted to explain what Burne Jones had meant by finish, and for this purpose produced a picture by Titian belonging to Ruskin.

When this was handed to the jury, however, one of them, mistaking it for a picture by Whistler, exclaimed: "Oh, come! We've had enough of those Whistlers," and they all refused to look at it!

The judge, in his summing up, explained that the words amounted to a libel, and that it was for the jury to consider whether the critic had made it a veil for personal censure. It was also a further point for them to consider whether the insult—if insult there had been—was of such a gross character as to call for substantial damages; or whether it was a case for merely contemptuous damages to the extent of a farthing or something of that sort.

The jury, after deliberating for an hour, gave a verdict for the plaintiff, with one farthing's damages, and the judge agreed with their contemptuous verdict by refusing to allow Whistler his costs.

Even if the jury in this case had been composed of

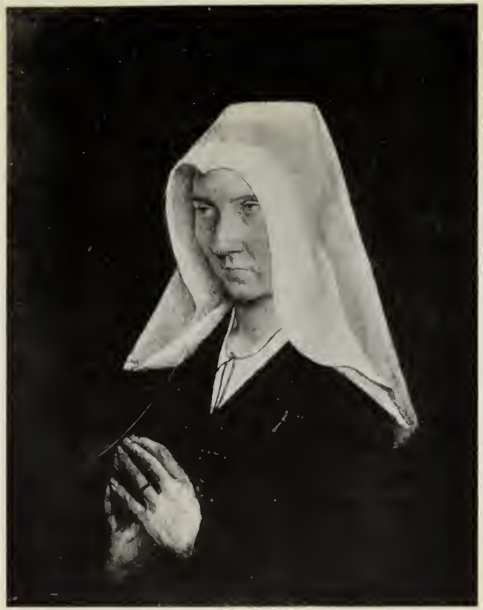


Fig 54.

Plate XVIII. Portrait of a Flemish Woman.

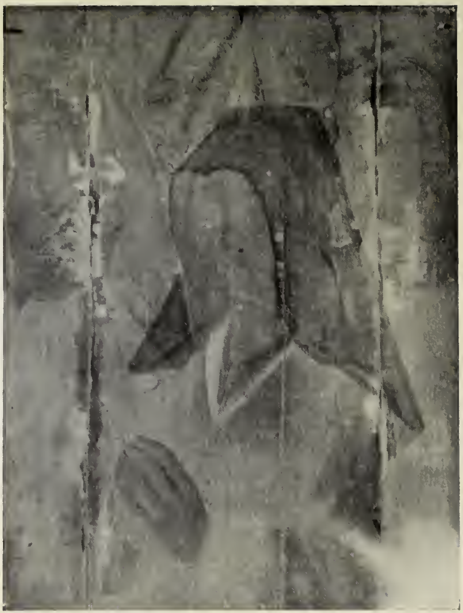


Fig. 55.

Plate XVIII. Radiograph of the same Picture, showing the Presence of an Earlier Painting.

To face page 158.]

artists, it is hardly likely that any other verdict would have been reached, for the objections of the academic artists of the day to the breadth of Whistler's impressions were usually as uncompromising as those of the small tradesman, artisan, or business man, from whom an average jury is mainly selected.

It is a significant commentary on the change of attitude of artists to work such as that of Whistler, that the picture of Battersea Bridge, to which such scathing reference was made at the hearing of the action, was bought for the National Gallery for two thousand guineas, and one of his "nocturnes" was hung by the side of Frith's "Derby Day." Evidently the Director of the National Gallery had a subtle sense of humour.

Since the ordinary jury of citizens is unsuitable to try a case of this kind, owing to their ignorance, whilst a special jury of artists might conceivably be prejudiced for or against either side, the fairest method would probably be for the case to be tried by a judge without a jury, but with the assistance of an adviser, who should be an artist of established reputation and broad sympathies, and to whom no exception should be taken by either side to the dispute.

When there is a conflict of opinion in the views expressed by artists, a fact outside the internal evidence of the picture itself may sometimes be conclusive, as was shown in 1917 in a case brought to determine the authenticity of a painting supposed to be by Romney. An American collector had bought the picture as Romney's work for £20,000, but it was subsequently alleged to be the work of Ozias Humphry, and expert evidence by well-known artists for and against this contention occupied the court for several days. It is an interesting speculation what the verdict would have been, had not counsel for the defence disclosed the fact, on the last day of the trial, that the original sketch of the picture, signed "O. H.," admittedly by Humphry, had just been discovered.

The picture had been sold in good faith as a portrait group by Romney, probably of Mrs. Siddons and her sister Fanny Kemble, but the sketch proved to be one catalogued as "Ladies Maria and Horatia Waldegrave," at the sale of the drawings of Ozias Humphry in 1846.

Scientific evidence may also dispose of the claims put forward by experts in art. A striking instance of this is to be found in the history of a wax bust, supposed to be by Leonardo da Vinci. It was bought for £9,000 in 1909 for the German National Collection by Dr. Bode, of the Berlin Museum. It was said to have been picked up originally for a few shillings in Southampton, and that the few persons to whom it had been offered in England would have nothing to do with it.

In answer to the German claim a letter was written to *The Times*, in which it was pointed out that Richard Cockle Lucas (1800–1883) had been seen by witnesses at work on a wax bust from a picture of "Flora," reputed to be by Leonardo da Vinci, and belonging to Buchanan, the well-known art dealer.

Dr. Bode and his friends, however, contended that Lucas was merely making a replica from the genuine Leonardo bust, and the conclusive fact that this bust had been found to have a stuffing of fabric of the Victorian period, did not change their belief in the

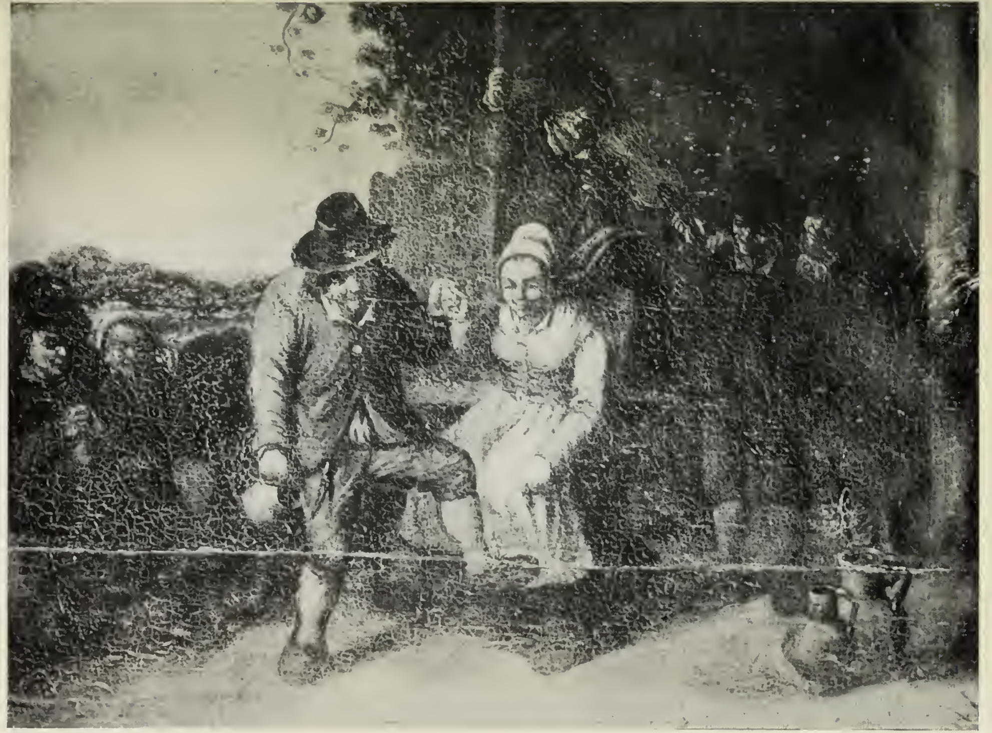


Fig. 56.

Plate XIX. Painting Attributed to Van Ostade, representing Peasants Dancing.

To face page 160.]

genuineness of their purchase. The question was finally settled by the Kaiser, who, after an examination of the bust, ignoring the fact of the stuffing, pronounced that it was the authentic work of Leonardo.

Too little use has been made in the past of scientific methods of confirming or disproving the opinions of art critics, although, as in the case of the Lucas bust, decisive information could frequently be obtained by an examination of the material of which the work of art is composed. Thus the fabric of the canvas, the pigment and the varnish on paintings would all repay scientific study.

The value of chemical and optical methods for the purpose of unmasking fraudulent old masters has recently been demonstrated by Major Kaye in a lecture before the Society of Arts. After the immense number of spurious painting in existence had been mentioned—not less than 5,000 paintings being attributed to Rembrandt alone—attention was directed to the use of photomicrography as a means of investigation. For example, in the case of a modern picture on wood protoplasm will still be present in the cells of the wood, whereas in the case of old panel pictures it will have completely dried up.

Again, anachronisms may be found in the chemical composition of the paint. Zinc white, for example, was not known three centuries ago, and old bitumen differs in its physical properties from the fresh material. The most interesting results which have been obtained, however, are in the application of the X-rays to the examination of paintings. Major Kaye points out that in the case of the pictures of the old masters the pigments are more opaque to X-rays than the sizing, whereas in the case of modern paintings, the reverse conditions obtain. As it may be regarded as a certainty that some of the materials used in the production of a faked picture will differ in their opacity to the X-rays from those of a genuine painting of the alleged periods, the method will frequently detect forgeries or more recent additions to an ancient canvas.

Striking examples of the kind obtained by Dr. Heilbron of Amsterdam, who examined various XVIth century pictures by this method, are reproduced here by the kindness of Major Kaye. A radiograph of the "Crucifixion" by Cornelis Engelbrechtsen revealed numerous "restorations," and the figure of a monk in surplice and stole had been replaced by that of a woman, who, it was conjectured, had been the donor of the picture, and had endeavoured in this way to associate her features with the painting. Upon the strength of this evidence the original figure of the monk was restored, after being concealed beneath a later figure for four centuries (Figs. 51, 52 and 53, Plate XVII). Another instance of the same kind, proving that a later picture had been painted over an earlier picture, is shown in Figs. 54 and 55, Plate XVIII.

The radiograph of another picture on a panel by Van Dyck, representing a knight with a horse and dogs, proved that originally the artist had painted a much larger waterfall, following a different course.

The same method was used by Dr. Chéron for examining a painting attributed to Van Ostade. The picture represented a Flemish scene, in which a party of peasants is watching a couple dancing (Fig. 56,

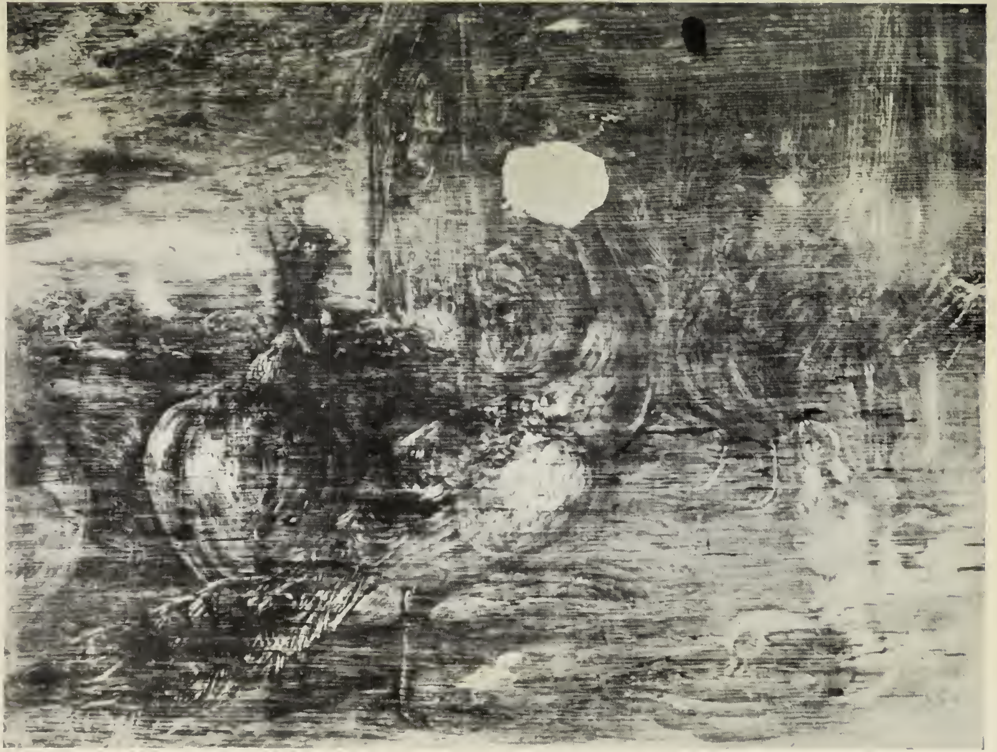


Fig. 57.

Plate XX. Radiograph of Picture shown in Fig. 56. This proves that the picture was painted over an earlier painting of a farm-yard scene.

Plate XIX.). The radiograph, however, revealed an earlier painting of a farmyard scene with peacocks, ducks and chickens (Fig. 57, Plate XX.).

Numerous other instances of the remarkable results obtained by the X-ray examination of painting might be cited, and it seems unnecessary to suggest that the method should always be applied when the authenticity of a reputed picture of an old master is called in question, more especially since, unlike chemical examination, it does not affect in any way the original painting.

The terms "Science and Art" are inseparably associated in the minds of state officials and of the public, although "Art" in the sense of the definition given on a previous page, cannot be brought within the compass of any science.

Doubtless the expert in art makes use of scientific methods of comparison and deduction in forming his opinion upon the merits of a work of art, but the abstract ideas connoted can hardly be brought within the scope of scientific demonstration, for the critic has to feel what the artist is wishing to convey.

Hence science can seldom offer assistance to the evidence of the artists on this point, but, as has been shown, a scientific examination of the material of which a work of art is composed may corroborate or disprove the opinion of the expert in art and may even by itself be the convincing factor in a case.

CHAPTER XI

Application of Expert Evidence to History

As we look back upon some of the great events of the past which have been made the subject of dispute among historians and have been interpreted in opposite senses, according to the weight which each has attached to external factors, such as the probable motives of those concerned or the gossip of the time, the thought at once suggests itself that if we could only have had contemporary scientific evidence embodying our knowledge of to-day, the general verdict of posterity might have been very different.

For instance, was the first Queen Mary of England the bloodthirsty tyrant of our school histories, or was her bigotry the outcome of a pathological condition which, if its results had not been so terrible, would have made us think of her only with pity? The modern interpretation of her medical history points to this conclusion.

This idea of the scientific interpretation of the records of the past has been developed by Mr. F. Chamberlin in his *Private Character of Queen Elizabeth*, into what may be regarded as a new historical method, and he has applied it with very striking results in several directions. For instance, there are many portraits of Queen Elizabeth extant, but even those for which equal weight of tradition can be claimed differ so much that we cannot come to any certain

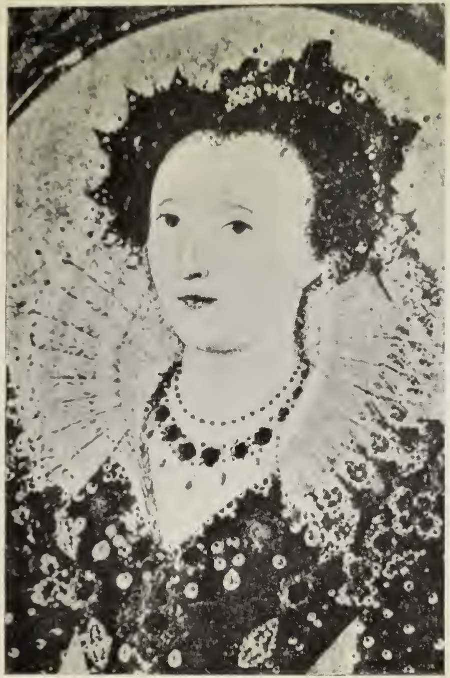


Fig. 59.

Plate XXII. Enlarged Miniature of Queen Elizabeth, at the age of about 30.

[*By permission of Mr. F. Chamberlin.*

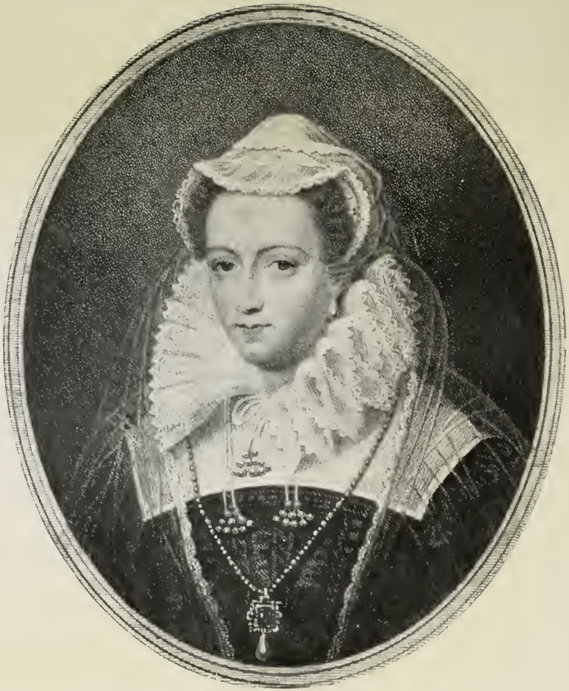


Fig. 61.

Plate XXII. Pailou's Composite Portrait of Mary, Queen of Scots (1818).

To face page 164.]

conclusion of what she was really like, even when we interpret them by contemporary descriptions. Mr. Chamberlin has therefore collected photographs of all the presumably genuine portraits of Elizabeth, and has submitted them to the skilled anatomical judgment of Sir Arthur Keith to decide whether the features in each are compatible with those in the rest, or whether the young girl represented in the Royal Collection at Windsor Castle could have developed into the older women of the other portraits. By this means the portraits with features quite out of keeping with the majority of the others were eliminated, and three were left, namely, the youthful Elizabeth in the Windsor Collection (Fig. 58, Plate XXI.); a miniature of her at about 30, by Hilliard, bound in Queen Elizabeth's prayer book, which has disappeared since 1892 (Fig. 59, Plate XXII.); and another miniature at about 60, also by Hilliard, in the Victoria and Albert Museum (Fig. 60, Plate XXI.). In the light of this expert evidence, therefore, these three portraits may be accepted as authentic likenesses of Elizabeth at three periods of her life.

This method of deciding between the claims of conflicting portraits is obviously much sounder than that used by Pailou in 1818 to obtain an authentic portrait of Mary Queen of Scots, for this has all the drawbacks without the impersonal note of modern composite photography, in which a series of portraits are superposed so as to obtain a composite giving the average features of them all.

Pailou's portrait was based on the picture in the possession of the Earl of Morton, which, according to tradition, was painted when Mary was a captive at Lochleven. It was corrected in detail by reference to the portraits or coins, which represented the Queen "with a cock-up nose," to the figure on the tomb in Henry VII's chapel, and to various sketches; and a final comparison was made with the full-length painting at Hatfield House and with portraits in the British Museum and in private houses. These comparisons by a trained artist resulted in the introduction "of a small degree of flatness at the end of the nose and a gentle indentation in the chin," and the final result is seen in Fig. 61, Plate XXII. This has some resemblance to the French portrait of Mary as a young widow, with which Pailou does not seem to have been acquainted; otherwise he would certainly have drawn upon it as one of his models, with a considerable effect upon his composite picture, especially upon the aquilinity of the nose.

A further use of modern scientific methods in interpreting history is seen in Mr. Chamberlin's study of the health of Queen Elizabeth and its bearing upon the commonly accepted view of her character. For this purpose he has collected the contemporary references to her health from every possible source, and has tabulated them chronologically, so as to obtain a complete medical record extending over the whole of her life. This record he has submitted, with a series of questions, to five of the leading physicians in this country for their diagnosis of the Queen's bodily condition and state of health from the data put before them. From the opinions thus obtained it is manifest that the accepted belief that Queen

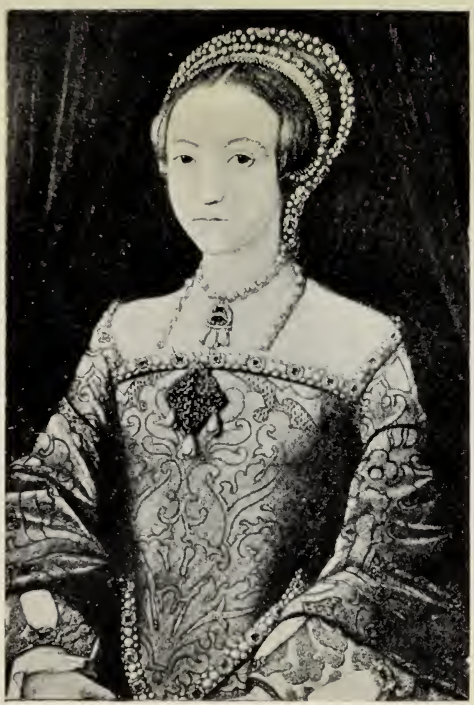


Fig. 58.

Plate XXI. Portrait of Queen Elizabeth at about 17. (Royal Collection at Windsor).

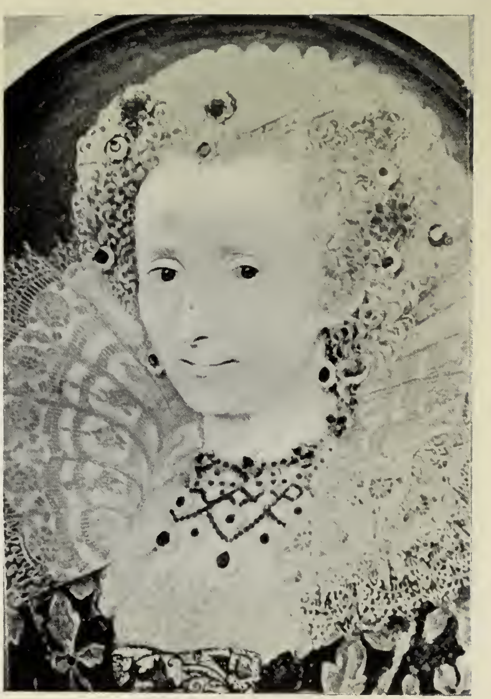


Fig. 60.

Plate XXI. Enlargement of Hilliard's Miniature of Queen Elizabeth at about 60.

[*By permission of Mr. F. Chamberlin.*

To face page 166.]

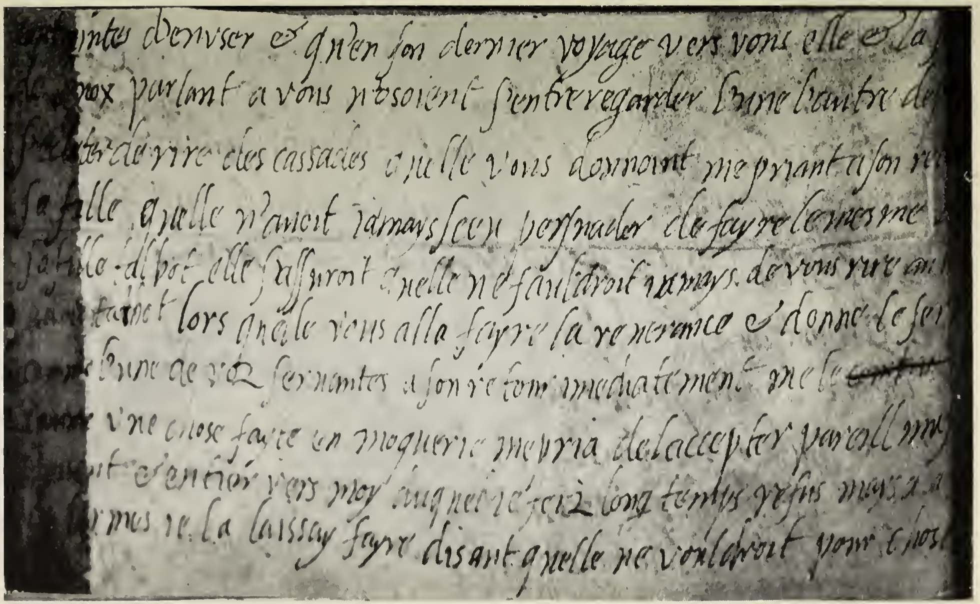
Elizabeth was of powerful physique and of robust health must be discarded; that, on the contrary, she suffered from chronic ill-health. To quote the words of Sir Arthur Keith: "In a medical sense her sexual system was blasted; she had the instinct of neither sweetheart nor mother. . . . If a study of Elizabeth's health and illnesses can throw a light on her character, and, through her, on the history of her period, it will be found, not in a study of her dropsies, fevers, smallpox, spice of mother, etc., but in the disordered condition of her sexual system." And again: "Elizabeth toyed with her young men, but one cannot conceive more than that. Her condition freed her from the bonds which bind most women, but in exchange she had to bear other bonds—the misery of disturbed health and ill-being."

This expert medical evidence upon the health of Queen Elizabeth goes a long way towards disproving the various charges of immorality which have been brought against her, for it eliminates the motive, and Mr. Chamberlin is also able to show that none of the other evidence can be accepted as conclusive, being either unsubstantiated gossip, or events which are capable of more innocent interpretation in view of the medical evidence.

Among the charges which he discusses at length are those contained in the remarkable "Scandal Letter," which Mary Queen of Scots is said to have written to Elizabeth in 1586, and it is to be regretted that Mr. Chamberlin should at this point have discarded the method of reference to scientific authorities which had served him so well, and should have used only his own unaided judgment in discussing the authenticity of this letter. Had he taken as much trouble to discover what scientific progress had been made in the methods of examining handwriting as he did to obtain expert medical evidence on the references to the health of Queen Elizabeth, he would not have committed himself to the statement that it would be an easy matter to forge a long letter such as this, or that in any case, an examination of the handwriting was not of much value as evidence of the authenticity of the letter.

In view of the doubts thus expressed, the present writer has, by the permission of Lord Salisbury, been able to examine the original and apply measurements to the writing in comparison with that of letters admittedly written by Mary Stuart (see Fig. 63).

The letter, a portion of which is reproduced in Fig. 62, Plate XXIII., is in French, and fills four closely written pages on paper of commoner quality than Mary was accustomed to use. It appears to have been received by Queen Elizabeth's secretary, for it is endorsed "readde" on the back in handwriting attributed to Robert Cecil. It well deserves its name of the "scandal letter," for it is a collection of scurrilous charges against Queen Elizabeth, which its writer states were made to her by the Countess of Shrewsbury. The Queen's lovers are said to include the Duke of Anjou, Simier (the French agent), and Sir Christopher Hatton, and definite instances of immorality are related. Moreover, Elizabeth is charged with being as vain as she is immoral, so much so that her courtiers flatter her grossly while laughing at her behind her back for her folly. So vain is she that the Countess has urged



intes denvoyer & quen son dernier voyage vers vous elle & la
nox parlant a vous nosoient sentreregarder lune lautre de
ter de rire des cassades quelle vous donnoit me priant a son re
sa fille quelle navoit iamays sceu persuader de fayre le mesme
sa fille Talbot elle sassuroit quelle ne fauldroit iamays de vous rire au
tant lors quelle vous alla fayre la reverance & donne le ser
lune de voz servantes a son retour immediatement me le ~~[illegible]~~
vne chose faite en moquerie me pria de la accepter pareill me
ent envers moy auquel ie feis long temps refus mays a
mes ie la laissay fayre disant quelle ne voudroit pour chos

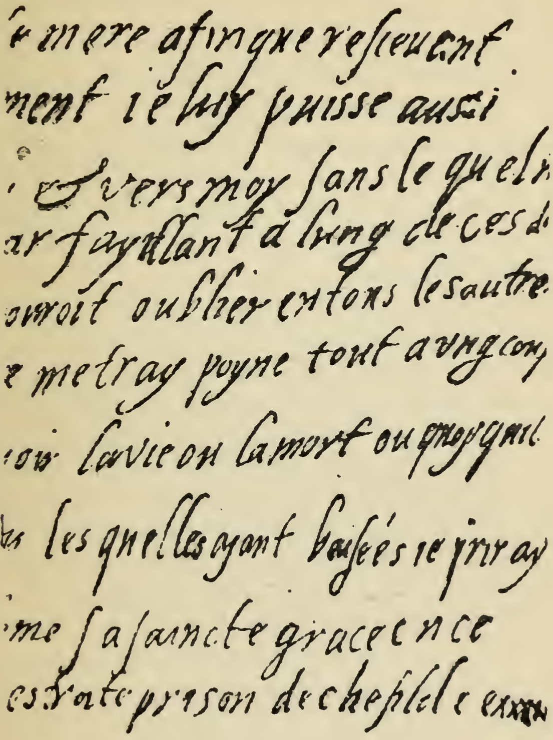
Fig. 62.

PLATE XXIII. PORTION OF THE "SCANDAL LETTER" WRITTEN TO QUEEN ELIZABETH.

[*By permission of Lord Salisbury.*

To face page 168.]

Mary to get her young son James to make love to Elizabeth, who would not see anything ridiculous in



e mere afin que reſieuent
nent ie luy puiſſe auſsi
& vers moy ſans le quel
ar faylant a lung de ces d
ouroit oublier en tous les autre
e metray poyne tout a vng con
oir la vie ou la mort ou moyenant
les quelles ayant baiſées ie priray
me ſa ſaincte grace en ce
es rate priſon de cheſfeld e

Fig. 63.

Admitted writing of Mary Stuart. Portion of a letter written to Queen Elizabeth.

such a proposal. Her temper, too, is extremely violent, and the Countess has said that on one occasion, in a passion, she broke the finger of one of her maids of honour. Elizabeth is even charged with having instigated Rolson to make love to her, Mary, with the object of actually dishonouring her or of ruining her reputation.

Although Mr. Chamberlin admits the possibility of this letter being genuine, he yet plainly shows that he doubts its having been written by Mary.

As already mentioned, he dismisses the question of the handwriting as of no importance, and bases his objection to the letter being genuine on the quality of the paper, the informal opening and ending, and the style of its language.

The argument as to the quality of paper would only be effective if it could be proved that Mary never wrote on similar paper from Sheffield.

Although Mary's letters to Elizabeth all begin and end informally, Mr. Chamberlin is mistaken in his assertion that the absence of a formal address or ending "is unique, either separately or combined, in any letter left to us in Mary's hand," for there is at Hatfield a letter written by Mary from Sheffield to Archibald Douglas in the same year as that attributed to the scandal letter, and this also begins without a formal opening.

Such informality indeed might even be used as an argument for the letter being genuine, for any forger who could create such a perfect imitation could hardly have been so ignorant of her style as to omit the formal "Madame," and so make the letter appear unusual.

The nature of the language used in the letter can hardly be regarded as a very weighty argument, for it would not be altogether an easy matter to retail backstairs gossip "with elegance." Moreover, when the same objection was urged, and with far more force, against the "casket letters" being genuine, it was dismissed by Hume and other historians as not of much importance.

In any case, arguments based on the style of the letter are largely speculative, and it is only by a scientific study of the writing itself that we can hope to come to a conclusion on the question with some degree of certainty.

It has already been pointed out in a previous chapter that the modern methods of judging handwriting are based upon the measurement of parts of letters and of the ratio which they bear to the whole letter, or of the proportion between the height of angles measured in a specified manner and the heights of the letter. Such minute characteristics are not usually introduced into imitated writing for the simple reason that the forger is, as a rule, unacquainted with their existence.

Although it might not be a very difficult matter to produce an imitation of a letter by Mary which would deceive a casual observer, it would be quite another matter to write a long letter in which the numerical ratios between the different characters were consistently preserved. If, to take one of the ratios, the heights of successive letters are measured and the variations represented in the form of a diagram, the average gradations in the heights will be found to agree in the writing of the same words both in the "scandal letter" and in the admitted writing of Mary Stuart, as is shown in Fig. 64, and the black line represents the admitted writing of Mary Stuart, the dotted line the "Scandal letter."

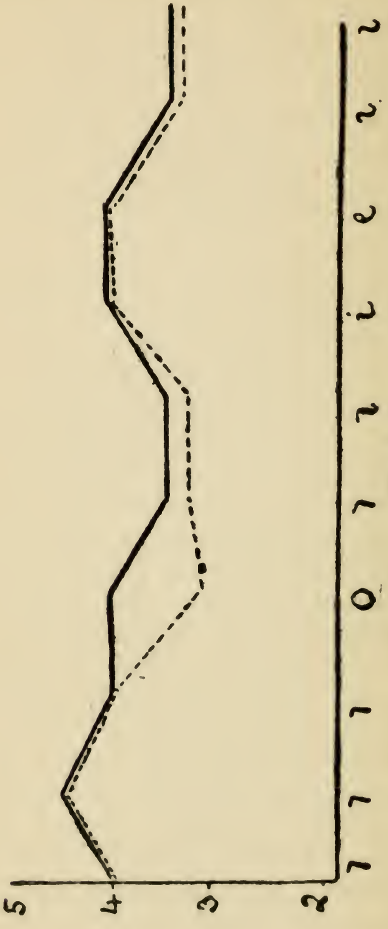


Fig. 64.

Diagram of relative heights of parts of letters in the words "mon dieu" in letters of Mary, Queen of Scots.

Not only does this and similar quantitative relationships agree in the two letters, but there are also similar variations to be found in the form of the characters in both, whilst, on the other hand, there is no peculiarity in form to be seen in the "scandal letter" which is not also present in specimens of Mary's admitted writing.

There is therefore no valid reason for doubting the authenticity of this letter, but many positive reasons for regarding it as the genuine writing of Mary Queen of Scots.

This inference does not, of course, affect Mr. Chamberlin's main conclusion that this letter cannot be accepted as evidence against the character of Queen Elizabeth, for Mary expressly states in two places that she herself does not believe the charges to be true.

It seems probable that her object in writing it was not only to revenge herself on the Countess of Shrewsbury and to make mischief between that lady and Queen Elizabeth, but also to sting Elizabeth into giving her that interview for which she had been begging in her letters for eighteen years.

"If," she says, "I can but have the good fortune of speaking with you, I will tell you in more detail the names, times, places and other circumstances, in order to let you know the truth about this and other matters which I reserve until such time as I am sure of your friendship."

If Mary's real object in writing this letter was to bring about the long-sought interview, she failed in her aim; the meeting between the two queens never took place. On the contrary, if we can accept the authority of Hume, this letter, which that historian characterises as "impudent and malicious," was largely responsible for the extreme severity with which Mary was treated at her trial a few months later.

Of far greater importance than this "scandal letter" are the copies of the "casket letters," also at Hatfield, which, according to the Report of the Historical Documents Commission, are supposed to have been produced in 1568 before the Commissioners appointed by Queen Elizabeth to report upon the alleged complicity of Mary in the murder of her husband Darnley.

When Mary fled to England in 1567 and threw herself upon the protection of Queen Elizabeth, that Queen refused to receive her until she had cleared herself of any share in the murder. Mary agreed to do this, and Elizabeth at once appointed Commissioners to investigate the charges, and although Mary at first refused to appear before them, she was ultimately induced to do so, and appointed her own Commissioners to watch her interests, whilst the Scottish Regent, the Earl of Murray,* the Earl of Morton, George Buchanan, and William Maitland of Lethington, who had formerly been secretary to Queen Mary, appeared to support the charges.

The early meetings went, on the whole, in favour of Mary, and the Commission was then transferred to Westminster, and the Scottish Commissioners were told by Elizabeth that they must produce more definite proof of Mary's guilt.

Then, on December 8th, 1568, the Earl of Murray produced a number of letters which purported to be love letters written by Mary to Bothwell prior to the death of Darnley, and, if authentic, would tend to prove that she was a party to the murder.

---

* The old spelling has been followed.

These were the celebrated "casket letters," which the Earl of Morton swore that he had taken from a silver casket which Bothwell had left in the charge of the Governor of Edinburgh Castle, and for which he had sent a messenger whom Morton had intercepted.

These letters were never seen either by Mary or her commissioners, and after the Conference they completely disappeared. They were stated to have been written in French, and a Scottish version was published a few years later by Buchanan, and was then translated by him into Latin, and from the Latin into French.

For three hundred years these much-translated versions became the subject of acrimonious dispute among historians, who spoke of each other as the "friends" or "enemies" of Mary, as the case might be.

Numerous gallicisms were detected in the Scottish and English versions, and it was shown that the sense had suffered considerably in the translation. For instance, in one letter the writer says: "I am irket (wearied) and going to sleep and yet I cease not to scribble all this paper." The translator of the passage evidently mistook the writing of "irket" for "naked," for the Latin is *ego nudata sum*; and from this the French version became *je suis toute nue.* As one 18th century commentator remarks, Mary must have had a very warm constitution to sit writing stark naked on a January night in Scotland.

It was not until about 1868 that the Hatfield versions were discovered, and Baron von Lettenhove

(1872) was quite convinced that one of these letters was the actual document produced before the Commissioners. "We have here," he says, "not a copy, but the original text. Everything proves it; the regularity of the writing, the erasures and the description on the back. We have under our eyes the straight regular characters of the 'Roman writing' mentioned in the minutes of the proceedings at Westminster."

The Historical Documents Commission is very guarded in its remarks on this letter, which is stated to be written in handwriting somewhat resembling that of Mary (see Fig. 65).

Lettenhove goes much further than this. He definitely asserts that the letter is a forgery concocted by Murray, Buchanan and Maitland, produced before the English Commissioners, accepted by them as in the handwriting of Mary, and afterwards concealed.

His principal arguments are that there are erasures and additions at the side of the letter, and that its phraseology shows that it was translated from a Scottish version into ungrammatical French such as Mary never used.

He even goes so far as to name the principal forger of this document. Even in the days of his contemporaries, assertions were made by Camden and others that William Maitland of Lethington (see Fig. 66, Plate XXIV.), who had once been secretary to Queen Mary, and had then become one of her accusers, had forged the casket letters. "Everything points to Lethington, who had betrayed her, as the forger," says Lettenhove, and he adds with picturesque detail:

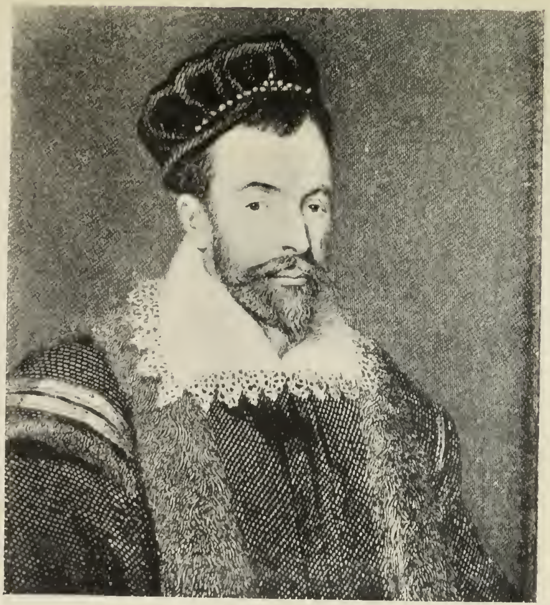


Fig. 66.

Plate XXIV. William Maitland of Lethington. Accused of Forging the "Casket" Letters.

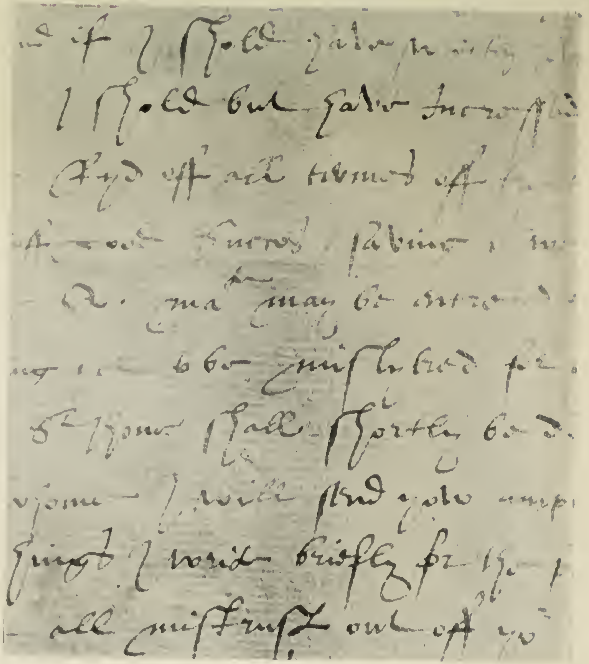
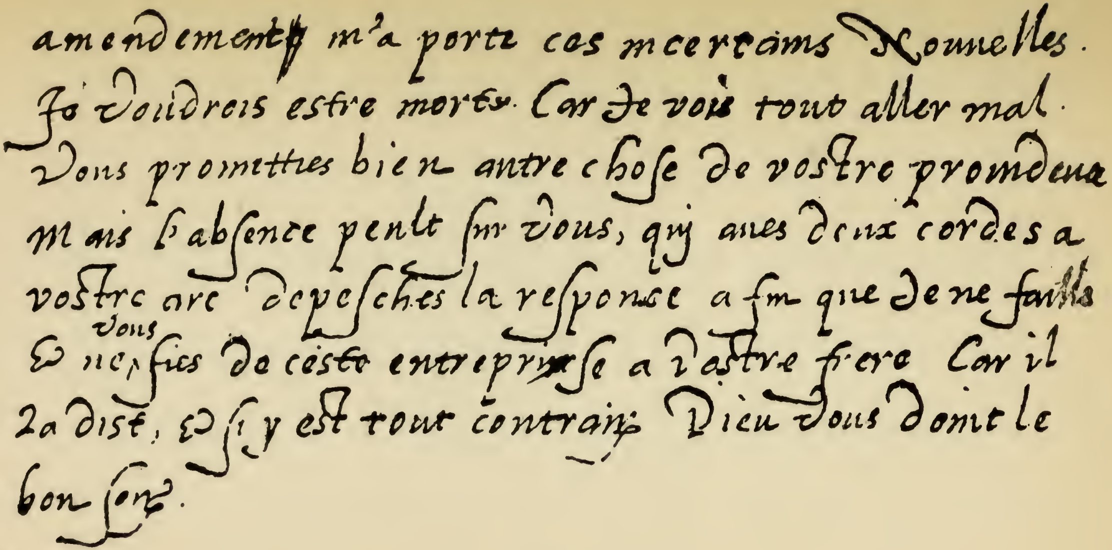


Fig. 67.

Plate XXIV. Portion of a Letter of William Maitland at Hatfield House.

[*By permission of Lord Salisbury.*

To face page 176.



amendement m'a porte ces incertains Nouvelles.
Je voudrois estre morte. Car je vois tout aller mal.
Vous promettiez bien autre choſe de voſtre prouidence
Mais l'abſence peult ſur vous, qui aves deux cordes a
voſtre arc depeſches la reſponce afin que je ne faille
& ne vous fies de ceste entrepriſe a l'autre frere Car il
la dist, & ſi y est tout contraire Dieu vous doint le
bon ſoir.

Fig. 65.
Portion of the 3rd "Casket Letter' at Hatfield.

[*By permission of Lord Salisbury.*

"Lethington pursued by remorse, afterwards killed himself."

When we turn from such speculations as these to an actual examination of this letter, the first thing that suggests itself is that, apart from the resemblance of the writing to that of Mary, there is no sufficient reason for separating it from the other casket letters at Hatfield. Three of them are in French, and the other three, which are endorsed "English copies," are either translations of those French versions or the Scottish letters first produced before the Commissioners at York.

A curious error and correction in one of the English letters, the significance of which has hitherto escaped comment, points strongly to the conclusion that it was a direct translation from the corresponding letter in French, and not, as Lettenhove suggest, *vice versa.*

It occurs in a passage which Mary's accusers put forward as evidence of her having incited Bothwell to murder Darnley while away from her, and runs as follows: ". . . *et faites bon guet si l'oseau sortira de sa cage ou sens son per.*" Originally "per," the equivalent of "pair," was "pere," but the final "e" has been struck out.

In the English version the passage is: "And watche well if the byrde shall fly out of his cage or without his father," which makes nonsense of the sentence. It was then corrected in writing, attributed to Burleigh, by deletion of the word "father," and substitution of the word "make" above it, this being an old English word for the mate of a bird.

The letter upon which Lettenhove has built up such a circumstantial charge of forgery, purports to have been written in April, 1567, by Mary to Bothwell, from Stirling. It warns him to beware of his false brother-in-law (the Earl of Huntley), who had come to her, and warned her against the proposed elopement, which would dishonour her, but that if Bothwell held firm, no persuasion, nor even death itself, would make her fail in her promise. She complains that he has not sent her directions, as he had promised, and asks him to choose the place and send her word of it. He has been negligent, but absence has power over him, who has two strings to his bow (*i.e.* two wives). She is sending the letter by a messenger, since she dare not trust it to his brother-in-law nor to the coach, and she ends with the words: "God give you good night."

This letter is headed "The Third Letter," but is endorsed by Cecil "5 French," and, in another handwriting, "Copie from Stirling afore the ravishment. Prufe of her mask of ravishing."

The other letters at Hatfield are similarly endorsed, and appear to form part of a series, two other letters of which are in the Record Office.

A comparison of the writing of this third letter with the writing of Mary has shown that, although there is a superficial resemblance between the two, it does not extend to the less obvious characteristics or to the quantitative ratios. This letter, therefore, is not an original letter written by Mary, but may, like its companions, be either an official copy of an original, or, as Lettenhove suggests, a forgery made by Maitland, or someone else, and accepted by the Commissioners at Westminster as the genuine writing of the Queen.

In fairness to Maitland it was necessary to compare the writing in this letter with his authentic writing at Hatfield, and a part of one of his letters, written at about the same time, is shown in Fig. 67, Plate XXIV.

It is not possible to trace any close resemblance between the two writings, either in the formation of letters, in the angular measurements, or in other quantitative ratios, and there is therefore no justification for the assumption that Maitland forged this document.

The true explanation of its origin is to be found in the minutes of the meeting of the Commissioners at Westminster on December 8, 1568. "This Daye the Earl of Murray according to the Appointment Yesterdaye cam to the Queenes Majesties Commissioners, saying, that as they had yesternight produced and shewed sundry Wrytings tending to proove the Hatred which the Q. of Scotts bare towards her Husband to the Tyme of his Murdre. Wherein also they said might appeere speciall Arguments of her inordinate Love toward the E. Bothwell, so for the further Satisfaction both of the Quene's Majestie and theyr Lordships they were ready to produce and show a great Nomber of other Letters wrytten by the said Q., where in as they said, might appeere very evidently her inordinate Love towards the said E. Bothwell, with sundry other Arguments of her guiltyness of the Murder of her Husband. And so thereupon they produced 7 several Wrytings written in French in the lyk Romain Hand, as others her Letters which weare shewed Yesternight, and avowed by them to be wrytten by the said Q. which seven wrytings being copied weare red in Frenche, and a due Collation being made thereof as neere as could be by reading and inspection, and made to accorde with the Originals, which the said E. of Murray required to be redelyvered, and did thereupon deliver the Copies being Collationed. The Tenors of all which seven wrytings hereafter follow in order, the first being in the manner of a Sonnet."

It seems obvious, therefore, that all these letters at Hatfield, including this third letter, are copies made by secretaries from the originals produced to the Commissioners, and that the corrections in the text and in the margins are those to which reference is made in the minutes of the meeting as having been made by the Commissioners themselves.

It is, of course, conceivable that Maitland, as some of his contemporaries asserted, forged the originals, but if so the forgery must have been prior to the first production of the letters in Scotland, for in 1883 Morton's sworn statement was discovered, and in it he relates how he opened the casket in the presence of several noblemen, whose names he would not have ventured to give if they could not have corroborated his statement that letters of the kind were there.

Lettenhove's flight of imagination, in which he pictures Queen Elizabeth demanding the production of the original letters, and Maitland's hurried translation of the original Scottish version into French, is not compatible with the preceding events and with Morton's uncontradicted statement.

Whether the original letters were genuine or forgeries could only be definitely settled by an examination of the writing, should they ever be discovered.

Mary herself always declared that they were forgeries: "Gif ony sic Writingis be," she wrote, "they are false and feinzeit, forgit and inventet by thameselfis onlie to my dishonour and sclander." Both she and her Commissioners asked to be shown the original letters, but this was refused, and one cannot accept as conclusive the untested opinion of the English Commissioners that the casket letters produced to them on December 8th, 1568, and returned at once to the Earl of Morton, were really in the handwriting of Mary Stuart.

Index

A

Aconite poisoning, 97
Adulteration of foods, 81
Advisers in conflicting evidence, 7, 79
Age of ink in writing, 117
Alchemy, 72
Analysts, Public, 83
Animals, nose prints of, 52
— skin patterns of, 51
Anonymous letters, handwriting in, 134
Anthropometric system of human identification, 25
Antimony poisoning, 95
"Appeal to the cow," 86
Arsenic, tests for, 94
Arsenical poisoning, 91, 93
Art, difficulty in determining merit in objects of, 152 *et seq.*
— experts in, 152
— scientific examination of objects of, 161

B

Bacillus botulinus, 108
Bacillus coli, 105
Bacillus prodigiosus, 104
Bacteria in bread, 104
— in canned fish and meat, 108
— in marine fish, 103
— in milk, 107
— in soda water, 104
— in vinegar, 101
Bacteriological evidence, 100
— investigation of food, 104
Bacterium xylinum, 102
Bank notes, forged, 111
Belt *v.* Lawes case, 153
Bertillon system of bodily measurements, 25, 37
Bishop of Lincoln *v.* Wakeford case, 134
Blacklead pencils, 125
Blandy, trial of Mary, 89
"Bleeding bread," 104
Blood, identification of, 76
— stains, methods of examining, 77
Bloodhounds, admissibility of, as evidence, 24
— identification by, 23
Blotting of ink in writing, 119
Bodily measurements as identification, 25
— remains as identification, 27
Body, behaviour in water of drowned, 59
— spontaneous combustion of human, 56
Bolam, trial of, 64
Botulism, 108
Bread, bacteria in, 104
Brook, trial of, 21
Butter, adulteration of, 85

C

Carbon inks, 113
"Casket letters" at Hatfield, 171, 174
— — comparison of writing with that of Mary Stuart, 179
— — examination of, by Lettenhove, 175
Cave dweller, restoration of features of, 34
"Certified" milk, 107
Chant, trial of, 23
Chemist, evidence of the, 72
Children's resemblance to parents, 9, 22

Clothing as means of identification, 22
Composite pencils, 127
— portrait of Mary Queen of Scots, 165
Copying-ink pencils, action of sea-water on, 128
— — composition of, 127
Counsel, duties of, 2
Cowper, trial of Spencer, 59, 138
Cows, noseprints of, 52
Cream, preservatives in, 88
Criminal responsibility, 69

D

Dentists' evidence, 28
Development of finger prints, 46
Documentary evidence, 110
Documents, erasures in, 111
— inks on, 112
Doe d. Mudd *v.* Suckermore case, 140
Dogs, evidence of, 24
— noseprints of, 52
Dominick la Rosa case, 35
"Doubles," 14
Drowning, death by, 59, 62
Drugs, examination of, 81
Dyes in inks, 114, 115

E

Egyptian graphite, 125
Environment, influence of, on handwriting, 136
Erasures in documents, 111
Evidence, admissibility of bloodhounds as, 24
— admissibility of finger-prints as, 42
— bacteriological, 100
— documentary, 110
— expert, 1
— eye-witnesses', 13, 14
— handwriting as, 132
— in art, 152
— in poison cases, 56, 89
— medical, 4, 52
Evidence, mistakes in, 4, 13
— of chemists, 72
— of drowning, 62
— of handwriting by relatives, 138
— of identity, 14
— of sorcery, 56
— of witchcraft, 54
— of wounds, 62
Examination of bloodstains, 77
— of drugs, 81
— of foods, 81
— of handwriting, 133, 149, 168
— of objects of art, 160
— of paper and sizing, 111
Expert evidence, 1
— — application of, to history, 164
— — conflicting, 6
— — fallibility of, 132, 143
— — method of presenting, 135
— — nature of, 1, 12
— — objections against, 12
— — value of, 12
— witnesses, 1
— — liability of, under law of libel, 141
— — training of, 1
Eye-witnesses, 13
— mistakes of, 14

F

Fibres in paper, 111
Finger patters, individuality of 38, 41
— — persistence of, 39, 41, 43
— print identification, 25, 37, 39, 42, 49
— — system, infallibility of, 42
— — — superiority over other means of identification, 44
— prints, classification of, 36, 38
— — method of developing, 45
— ridges, pores on, 37
— — unchangeability of, 42

Fish, bacteria in canned, 108
— bacteria in marine, 103
— phosphorescence in, 103
Flashlight identification, 21, 22
Food, adulteration of, 81
— and Drugs Act, 83
— bacteriological examination of, 104
— examination of, 81
— preservatives in, 87
Foot prints as identification, 22, 30, 49
— — of animals, 51
Forgery of banknotes, 111
— of cheques, 129
— of historical documents, 110
— of wills, 116, 121, 140, 141, 146
— trials, 110, 111, 114–116, 119, 129, 139, 141
Formalin for invisible writing, 124

G
Gorse Hall mystery, 15
"Grade A" milk, 107
Graphite, ancient Egyptian, 125
— in pencils, 125
Graphometry, 150

H
Handwriting as evidence, 132
— disguised, 134
— experts, 132
— influence of environment on, 136
— influence of heredity on, 136
— quantitative method of examining, 149, 171
— relatives' evidence of, 138
— scientific examination of, 133, 145, 149, 168, 171
Heel patterns, 51
Henbane poisoning, 99
Heredity, influence of, on handwriting, 136
Historical documents, forgery of, 110
History, application of expert evidence to, 164
History, scientific interpretation of, 164
Howland, trial of Sylvia Anne, 146
Humphrey, trial of Alexander, 115
Hunt *v.* Richardson case, 86
Hyoscyamus poisoning, 99

I
Identification by bloodhounds, 24
— by bodily measurements, 25
— by bodily remains, 27
— by flashlight, 21, 22
— by footprints, 22, 30
— by fragments of clothing, 22
— by laundry marks, 22
— by walk, 20
— human, 14
— in defective light, 20
— indirect evidence of, 23
— mistaken, 14
— of blood, 76
— of skin prints, 37
Identity, evidence of, 14
Indigo in inks, 114
Ink, age of, 117
— dyes in, 114
— examination of, 113
— invisible, 122
— on ancient documents, 112
— types of, 112
Insanity, definition of, 67
— legal test for, 67
— moral, 70
Insurance frauds, 65
Invisible inks, 122
Iodine vapour for developing finger prints, 46
Iron gall inks, 113

L
Lamson trial, 99
Laundry marks as identification, 22
Left-handedness as evidence, 63
"Legal test" for insanity, 67
Legitimacy cases, 8–10

Lemon juice for invisible writing, 124
Lettenhove's examination of "Casket Letters," 176
Letters, measurement of height and angles of, 149, 150
Liability of expert witnesses under law of libel, 141
Locard's method of graphometry, 148
— quantitative method of examining handwriting, 149
Loch Maree poisoning case, 108

M

Macbeth v. King case, 128
Maitland, charge of forgery against William, 176
Marsh's arsenic test, 94
Mary Queen of England, 164
Mary Queen of Scots, composite portrait of, 165
— "scandal letter" of, 167
— "casket letters" of, 174
— writing of, 169
McConkey trial, 97
Measurements of body as identification, 25
— — letters in handwriting, 149, 150
Meat, bacteria in, 103
— — — canned, 108
Medical evidence, 4, 53
— history of Queen Elizabeth, 166
— witnesses, 53
"Membland" case, 128, 143
Milk, adulteration of, 84, 85
— bacteriological examination of, 107
— preservatives in, 87
— standards for, 107
Millet murder trial, 57
Mistakes in identification, 14
— made by witness, 4
Moral insanity, 70
"Mother of vinegar", 101

N

Nairn, trial of Katharine, 90

O

Ogilvie, trial of Patrick, 90
Old age pension frauds, 114
Osmic acid vapour for developing finger prints, 46

P

Paint, chemical composition of, 161
Paintings, scientific examination of, 161
Paper, chemical examination of, 111
— constituents of, 111
— microscopical examination of, 111
Parentage, scientific methods of determining, 11
Parents, resemblance between children and, 9, 23
Pasteurised milk, 107
Patterns on ridges of fingers, 38, 41, 43
— on skin ridges of animals, 51
— on soles of feet, 50
Pencil markings on ancient documents, 126
— — examination of, 126
— writings, 125
Pencils, blacklead, 126
— composite, 127
— composition of, 125
— copying-ink, 127
Perreau forgery case, 139
Persifor Fraser's method of examining handwriting, 149
Photography as adjunct to evidence, 10, 24
— composite, 165
Photomicrography in examination of paintings, 111
Pigs, noseprints of, 52
Poison trials, scientific evidence in, 56, 89
Poisoning with aconite, 97
— — antimony, 95
— — arsenic, 91, 93
— — canned food, 108
— — henbane, 108
— — strychnine, 95

Poisons, definition of, 91
Pores on finger ridges, 37, 47
Poroscopy, 46
Portrait of Mary Queen of Scots, composite, 165
Preservatives in food, 87
Psychological influence on hand writing, 136
Public Analysts, 83
Purkenje's classification of skin patterns, 38

Q

Quantitative methods of examining handwriting, 149
Queen Elizabeth, medical history of, 166
— — portraits of, 164

R

Radiography in examination of paintings, 161
Ratio measurements of handwriting, 151, 171
Reagents for developing finger prints, 46
Receipt stamps as evidence, 129
Referees, independent, 7, 8
Resemblance of children to parents, 9–11, 23
Restoration of features on skulls, 32
Rex *v.* Beck case, 17, 137
— *v.* Brinckley case, 116
— *v.* Cohen case, 119
— *v.* Courvoisier case, 3
— *v.* Crippen case, 28, 99
— *v.* Fink case, 129
— *v.* Hahn case, 124
— *v.* Howard case, 15
— *v.* Kuepferle case, 123
— *v.* MacNaghten case, 68
— *v.* Menzies case, 114, 118
— *v.* Muller case, 124
— *v.* Palmer case, 4
— *v.* Pilcher case, 121
— *v.* Seddon case, 122
— *v.* Smethurst case, 7, 93
— *v.* Thompson case, 16
— *v.* Wood case, 127
Rice-Patrick case, 147
Richardson murder trial, 30, 63.
Risley case, 131
Ruskin libel action, 154

S

Saliva for invisible writing, 125
Salt as poison, 92
"Scandal letter" of Mary Queen of Scots, 167
Scarloti trial, 43
Scientific advisers, 7, 79
— examination of handwriting, 133, 145, 149, 168, 171
— — — objects of art, 161
— — — paintings, 161
— interpretation of history, 164
— measurements of the body, 25
— methods of determining parentage, 11
— referees, 8
Sealing wax on documents, 129
Seaman *v.* Netherclift case, 141
Sea-water, action of, on pencil writing, 128
Sequence of strokes in writing, 120
Signatures, identification of, 143
— — — traced, 145
Sizing of paper, 111
Skin patterns, 27
— — of animals, 51
— prints, classification of, 38
— — identification, 37
Skulls, restoration of features on, 32
Slingsby case, 8
Smithies *v.* Bridge case, 86
Soda water, bacteria in, 105
— — manufacture of, 106
Sole prints, 49
Soles of feet, patterns on, 37
Sorcery, evidence of, 56
Spontaneous combustion, 72
— — of human body, 56, 72
Spy cases, 123, 124

3 1699 000 676 892

Standards for genuineness of food, 85–87
— — milk, 107
Sterilisation of canned meat and fish, 108, 109
— of milk, 107, 108
— of soda water, 105
Stout, trial of Sarah, 59, 138
Strychnine poisoning, 95
Sugar, adulteration of, 94

T

Tattooing as means of identification, 31
Teeth as means of identification, 28
Tep-sai, 40
Tests for arsenic, 94
Truscott, trial of Sir Francis, 137
Tunnicliffe *v.* Oldcorn case, 144
Turner murder trial, 56
Typewriting characteristics as evidence, 129, 130

V

Vinegar, adulteration of, 87
— method of manufacturing, 100
— mother of, 101

W

Water as a "noxious drug"
Watermarks in paper as evidence, 110
Webster murder trial, 28
Weston, trial of Richard, 89
Whistler libel action, 154
White shooting case, 21
Will West, the two, 26, 44
Wills, forged, 116, 121, 140, 141, 146
Witchcraft, 54
Witnesses, expert, 1
— medical, 53
— mistakes of, 4
— unscrupulous, 2
Wood murder case, 20
Wounds as evidence, 62
— self-inflicted, 64

X

X-ray examination of paintings, 161

Z

Zoogloea, 101

W. Heffer and Sons Ltd., Cambridge, England.

DATE DUE

MAY 08 1993

APR 1 9 2001

DEMCO NO. 38-298

13 181NY2 BR 5558
05/95 04-344-00 GBC